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F. B. WEBSTER, Editor
H. H. BROWN, Managing Editor
L. S. BLODGETT, Associate Editor W. Z. GARDNER, News Editor

Contributing Editors

Rear Admiral C. W. Dyson, U. S. N. William T. Donnelly
Commander S. M. Robinson, U. S. N. H. McL. Harding
William Gatewood James L. Bates
Captain C. A. McAllister, U.S.C.G. (Retired)

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Is Co-operation the Solution?

ACCORDING to Mr. James A. Farrell, president of the United States Steel Corporation, in his address before the recent Foreign Trade Convention at New Orleans, the solution of our shipping problem, and the shipping situation of the world as well, lies in co-operation. He would have the Shipping Board say to American companies: "Co-operate with the foreign lines now competing with you; furnish one-half of the tonnage required to move the freight over a particular route; each to act as loading and discharging agent for the other; each to plan which ships of the two companies will operate on an alternate schedule and thus receive an equal portion of the business moving in both directions. In brief, replace unbusinesslike competition with sound co-operative operations; which will substitute profits for losses and will demonstrate to the American investor the advantage of owning shares in American ships, particularly at the low market prices prevailing today. The Shipping Board to sell to the American company the ships required for his share, and to sell to the foreign company such ships as may be required for his share. The price of the ships to be the same to each."

At first reading, one is apt to doubt the possibility of interesting, say, well-established British shipping companies in any such proposition but taking into consideration the fact that the depression in shipping is world wide, that all maritime countries are confronted with problems similar to our own, due to overbuilding and the high prices paid for tonnage after the war, the advantages of an international regulation of the number of ships in the various trades are certainly worth considering.

No matter how strong financially a foreign shipping line might be, if it were confronted with the proposition of co-operating with a privately operated line or the alternative of competing with a Government-owned line having the Treasury behind it, there certainly would be a great incentive to take the course that would lead to adequate freight rates and a solution of the surplus tonnage problem through the co-operative method. If this is not so, why have pooling and rate conferences been so successful?

We are not in such a poor position to open negotiations for a co-operative plan as a good many people would naturally believe. It is true that our overseas commerce in privately-owned American ships is practically nil but, including our Government-owned ships, it has not so far to go to reach the coveted 50 percent of our foreign trade. This means that we have far more freight vessels than we can possibly use while, on the other hand, foreign maritime countries must sooner or later replace their obsolete vessels with modern ships.

To replace their vessels by new construction, as Mr. Farrell points out, would cost in the neighborhood of $50 a deadweight ton in England while it would be good business for us to remove the menace that these vessels are to the shipping of the entire world by selling them at $30 a deadweight ton. If a foreign line is willing to co-operate, let it enjoy the privilege of purchasing such ships from us as it may need on equal terms with American companies.

Now foreign shipping executives may not realize that America is determined to establish an adequate merchant marine of its own, even if it had to do so under the undesirable system of direct Government operation. They may not realize that since the defeat of the subsidy bill the tendency of Congress is distinctly toward discriminatory policies which, whether successful in their object or not, would certainly cause a great deal of damage to foreign lines. But they must realize that if a system of co-operation between American railways and American shipping is put into effect it would have a great influence on the amount of business that foreign lines could obtain.

Such a co-ordination may be forced at any moment, for the Merchant Marine Act of 1920 provides that unless the Shipping Board is convinced that there are not sufficient

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American ships to take care of our commerce and so certifies to the Interstate Commerce Commission that the railroads cannot grant export rates to any but American ships.

How much better it would be if an amicable understanding could be reached with our maritime rivals on the basis of a fifty-fifty division of the direct trade. It would promote friendly relations and new business. It would secure stable and adequate rates for shipping without destroying competition in service and it would make work for the shipyards in reconditioning steamers and also in converting a goodly number of vessels to motorships.

A Reflex of the Defeat of the Ship Subsidy Bill

"AMERICAN bid for the world's carrying trade, about which so much was heard a couple of years ago, need not be seriously regarded."

The quotation is from an article in the Shanghai (China) Sunday *Times* of April 1 by its special trade correspondent at London, headed "Great Britain's Lead in New Ship Construction."

While at no time was it likely that the United States would ever take from England "the world's carrying trade," it is true that there *was* a chance to control a considerable part of its own cargoes, both outgoing and incoming. That hope, however, faded with the defeat of the ship subsidy legislation through a plot within the senate equally dastardly, in its way, to the one which nearly succeeded in a vote in favor of Nicaragua instead of Panama as the route for the Isthmian Canal.

In the same article the correspondent says: "I learn from reports received from the Clyde that new orders are exceeding the amount of gross tonnage launched and it is significant that the present is usually the dead season of the year in shipbuilding yards. Similar reports come from the Mersey and Tyneside." This is augmented by figures compiled by the Chamber of Shipping of Great Britain which show that on April 1, 1923, the idle tonnage of British merchant vessels was but 546,000 tons against 1,112,000 tons on July 1 of last year. Incidentally, the April 1 figure is the lowest since December, 1920, when the statistics were first collected.

In the Japan *Advertiser* of May 3 we read under the heading "Eleven Steamship Firms Get Subsidy" the fact that the Imperial Diet has voted three-year mail subsidies to 23 steamers operated by 11 different concerns; while from private sources comes the news that steps are being taken to improve the Pacific ocean steamship service of the Japanese lines between this country and the Orient. This may take some time but the policy is definite. Then, too, the Canadian Pacific Steamships, Ltd., is considering, if indeed it has not already decided upon, the routing of some of its fine *Empress* ships to Japan and China via the United States.

Since Congress will not again convene until December, and since the chances for the enactment then of legislation favorable to the American merchant marine are comparable to the odds in favor of the leopard changing his spots, it is distinctly up to the American shipbuilding and shipping industry to succeed in spite of the selfish acts of designing politicians.

MARINE ENGINEERING AND SHIPPING AGE has printed much about things which shall be done, if America is to take its proper place among the maritime nations of the world. From now on it will endeavor to so concentrate on its constructive program as to make the needs and ways and means clear at a glance. All of our efforts will be of no avail, however, without the hearty cooperation of all concerned. We refer not alone to the individuals and concerns who have to do with building and operating ships but also to the various organizations in the marine field, such as the Society of Naval Architects and Marine Engineers and American Marine Association.

It *can* be done. America as a nation has never yet failed in any undertaking of moment on which it has concentrated; and there is no reason why the shipping industry of the country should not by the same process remove the obstacles in its path. It *must* be done!

Does echo answer, "It *shall* be done?"

The Farmer's Interest in Shipping

THE farmers ought to be more concerned in the solution of our merchant marine problem than any other class of producers. It is important that the manufacturer who can regulate the creation of his products from day to day should have the facilities of sending his goods to foreign markets directly and promptly without transshipment, but it is far more necessary that the farmer whose potential wealth comes in harvests should be sure that he can place his grain on the market where he wants it and when he wants it there.

As pointed out by Mr. O. E. Bradfute, president of the American Farm Bureau Federation, at the eleventh annual meeting of the Chamber of Commerce of the United States, "the farmer pays the freight both ways. No matter whether that market be in Liverpool, in the case of wheat, or whether it be closer, the farmer pays the freight to the terminal or final market of his product." Taking the case of wheat grown in Kansas, he stated that the price obtainable for that wheat in Kansas in normal times was the price obtainable in Liverpool minus the cost of transportation of the wheat from Kansas to Liverpool. On the other hand, if the farmer buys an automobile the price is determined by the f.o.b. standard at the factory.

It is only natural, therefore, that the farmer should only consider the cost of transportation without considering whether or not the rates charged are sufficient to maintain a service that will always be at his disposal, no matter what conditions prevail in Europe. He quickly forgets the periods when tremendous sums of money were lost because foreign ships were withdrawn from our shores and concerns himself still less, if a foreign ship will take his wheat cheaper, with the reason why it is able to do so.

Far be it from our purpose to even suggest that the farmer should saddle the whole burden of the merchant marine. We do, however, want him to take an interest in shipping and to take part in the plans that must be made to formulate a

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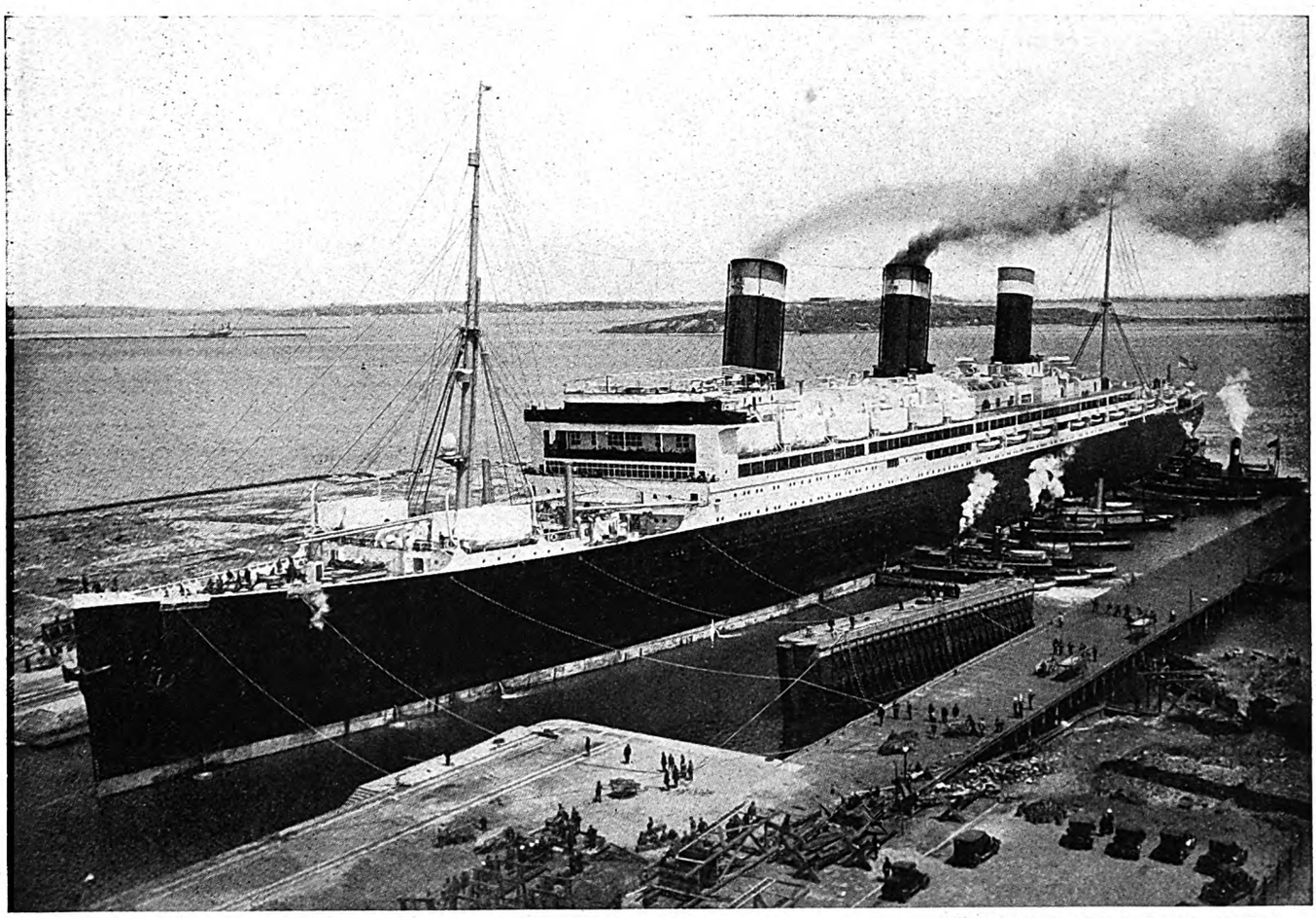
permanent policy upon which our merchant marine can be developed. If he does this, facts and findings upon which Congress will act can be devised but, if he remains aloof and fails to demand action from his representatives, then he more than any one else will be the principal sufferer, if ocean shipping reverts to the control of foreign lines who will fix the freight rates to suit no one but themselves.

Hull Surveyors' Pay

MARINE underwriters have been indulging in a discussion of the remuneration of their hull surveyors, and it develops that there is an uneasy impression among them that these important representatives are too often underpaid. With the larger insurance offices a staff of salaried surveyors is regularly maintained, but with the lesser lights it is the custom to employ unattached experts on a per diem or single inspection basis. It is the latter who are in a mood to rebel. They insist, and properly, that $15 is scarcely adequate remuneration for a single inspection, especially when it is remembered that to prepare a man for such work a training of from five to ten years is absolutely necessary. The price is not invariably $15, of course, but frequently it is no more. On the other hand, it is always much more than that when the experts are employed by the assured or the repair yards—a field where only the very highest grade of talent is wanted. The underwriters' surveyor argues that his problems are intricate and of the first importance, and that he is brought into contact with the best minds in his line when he matches skill with the men hired by the assured and the repairers, whose interests are frequently directly opposed to those he represents. He complains that for work of the same grade as that for which he receives $15 or $25 his rivals are paid from $50 to $150; and the oddest thing about it is that these latter bills are in turn passed along to and paid by the same company of insurers that hands him out his lesser dole. When the matter is taken up with the underwriters the objection advanced to higher pay is that expenses must be kept down. A prominent underwriter, in an interview with one of our reporters, admits the propriety of the surveyors' complaint. He agrees that it is more than ever necessary at this time to keep marine insurance expenses down, but he feels that possibilities for saving do not lie in the direction of insufficient salaries for these very useful men. He feels that attention may well be paid to many of the items which enter into claims against underwriters, among them the fees allowed to the surveyors appointed on behalf of the assured but paid by the assurer.



(Photograph by Edwin Levick, N. Y.)

Steamship Leviathan, the Largest Ship in the World, Entering the Commonwealth Dry Dock at South Boston, Mass.

The *Leviathan,* while in Boston, will have her bottom scraped and painted, her propeller shafts drawn and her steward supplies and other furnishings installed. On about June 15 she will start on a five-day trial trip to the neighborhood of Cuba with a party of several hundred distinguished guests on board. On this trip her picked crew and steward's department in particular will be given an opportunity to show their efficiency. On her return she will dock at New York where she will remain until July 4 when she will start on her maiden voyage as a premier passenger liner under the American flag to Cherbourg and Southampton.

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E. P. Farley Appointed Chairman of Shipping Board

Definitely Decided to Adopt Direct Government Operation Unless Satisfactory Offers for Shipping Board Vessels Are Received

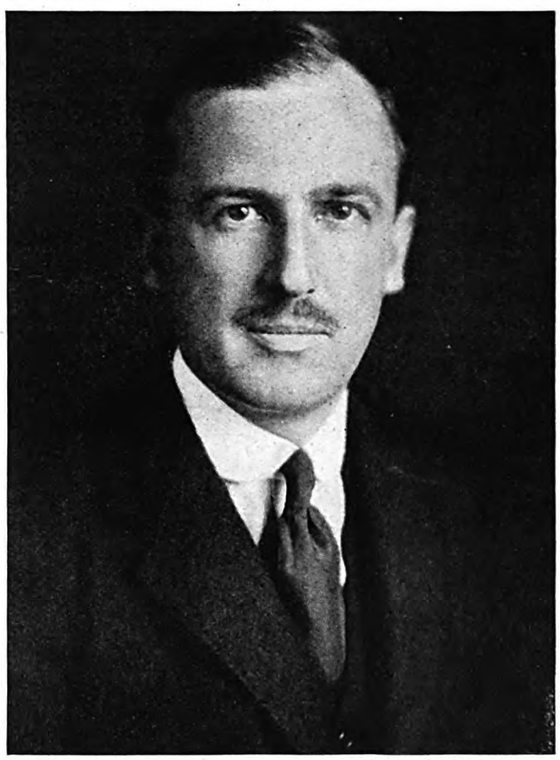
By Harold F. Lane*

ONCE more the United States Shipping Board is about to enter upon a new régime involving not only important changes in personnel, as the result of resignations, but also a probable change in its methods of operation, as it has been definitely decided to go to direct Government operation of the board's fleet unless satisfactory offers are received for its ships.

Albert D. Lasker, who has presided over the destinies of the Shipping Board as its chairman for the past two years, and who also led the administration's unsuccessful campaign for a ship subsidy bill, has resigned, effective on June 12, and the President on May 10 announced the appointment of Edward P. Farley, of Chicago, as his successor.

Commissioner Chamberlain has tendered his resignation to the President and will retire from the board some time in June and President J. B. Smull of the Emergency Fleet Corporation has announced his intention of leaving by July 1. Commissioner Thompson planned some time ago to quit upon the expiration of his term in June, but it is now expected that he will be reappointed and remain on the board.

Mr. Lasker's resignation, as well as that of Mr. Smull, is in accordance with the understanding had with the President. Mr. Lasker had promised to stay two years, which time expires on June 12. Mr. Smull had originally planned to return to private business on March 4 but then agreed to remain until Mr. Lasker resigned. Mr. Lasker plans to return to his advertising and other business affairs in Chicago. However, because the *Leviathan* was reconditioned under his régime, the Shipping Board unanimously adopted a resolution appointing him special representative in charge of her trial trip in June and also her initial voyage beginning on July 4 from New York to Cherbourg and Southampton.



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E. P. Farley, Who Will Succeed A. D. Lasker as Chairman of the Shipping Board

The New Chairman

Mr. Farley, the new chairman of the Shipping Board, is not a stranger to its affairs nor to the shipping business. He came to Washington in 1921 as vice-president of the Emergency Fleet Corporation in charge of liquidation and resigned to return to private business last August. Prior to his connection with the Fleet Corporation he had had 12 years of experience as a shipowner and in ship brokerage and marine insurance as president of the Edward P. Farley Company, of Chicago.

*Our Washington correspondent.

Mr. Farley was born in Madison, Wis., and was educated in private and public schools and at the University of Wisconsin. In 1909 he organized the Edward P. Farley Company and he was also later president of the Farley Navigation Company and the Waukua Transit Company, director of the Cornwall Terminal Company and secretary of the Glen Transportation Company. Since his resignation from the Fleet Corporation last August he has devoted his time to the affairs of the Lincoln Mills Paper Company, of which he was chairman of the board of directors. He is also a director of the Inderrieden Canning Company.

The announcement of his appointment from the White House said that the President and Mr. Farley had had numerous conferences, including an extended one on that day, and that he is in full accord with the policy previously announced by the Shipping Board and by the President for the maintenance of the American merchant marine. Chairman Lasker also said that Mr. Farley had played a part in the formulation of the policy of direct Government operation of the ships in case they could not be sold and that he had been in close touch with the board's affairs for several months.

The understanding that Mr. Farley would be the next chairman of the board was reached some time ago. He had been recommended not only by Mr. Lasker, but also by Walter C. Teagle, president of the Standard Oil Company of New Jersey, who had been offered the chairmanship before Mr. Lasker was appointed and who has conferred with the President on Shipping Board affairs on several occasions. Mr. Farley is fully informed as to the difficulties involved in trying to sell the Government's ships as he was in direct charge of the negotiations for ship sales while he was with the Fleet Corporation. In that connection he made a reputation for being a shrewd negotiator.

MO-4 Agreements to Be Superseded

While the exact conditions under which the board will manage the fleet, if it is found necessary to go to direct Government operation, have not been announced, it is understood that the new chairman is fully in accord with the general opinion of the board that the new policy will not involve any arrangement between operators and the board similar to the present MO-4 agreements. The board has tolerated them in the hope that it would be able to sell the ships and

(*Continued on page* 328)

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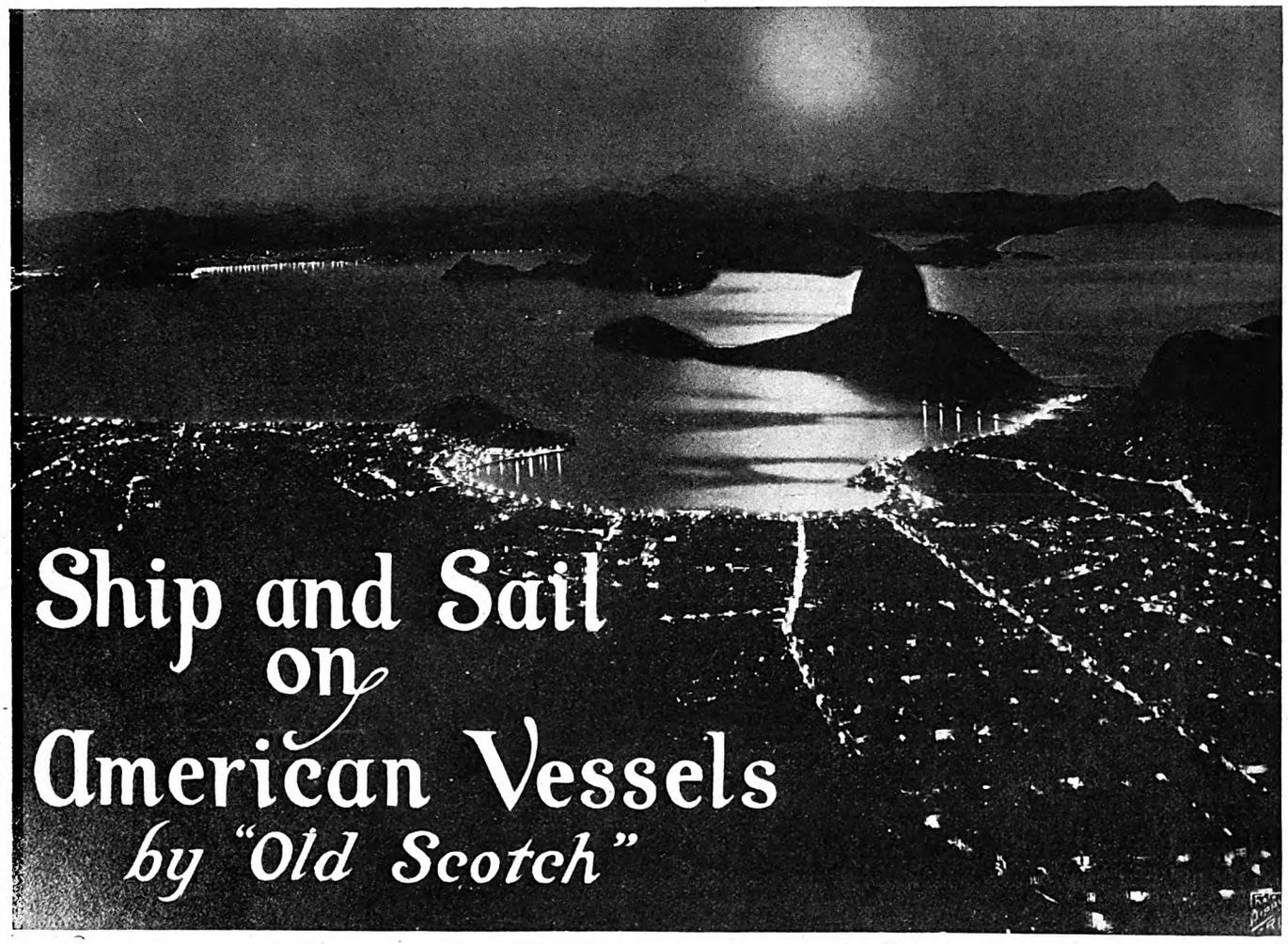

Ship and Sail on American Vessels

by "Old Scotch"

DURING the controversy over shipping legislation last year, a very prominent American in a public speech said that if Americans would patronize their own ships with anything approaching the patriotic fervor given foreign ships by other nations, there would be but little need of Governmental help in this country. Considering that Americans are the greatest travelers in the world, and that more goods arrive and leave our ports annually than are handled by any other one nation, there is little doubt of the truth of his assertion.

Today, Americans can travel to almost all of the leading ports of the world in ships flying our own flag. Furthermore, for comfort, excellency of cuisine, and reasonableness of costs of transportation, it is difficult to excel these American lines. To arrive at the first hand knowledge of these assertions, the writer with his family recently made a trip on the *American Legion* to South American ports. This ship is one of the famous 535's owned by the Shipping Board and operated by the Munson lines on this important route. Other ships of the same type are operated to Europe and to the Orient.

The experience of the writer on this trip was so highly satisfactory and pleasing in every way, that a resumé of the principal features will, it is hoped, be of interest to people in the shipbuilding and marine field generally, and may possibly encourage some of them to make similar trips, and thus enjoy the fruits of their handiwork.

South American Traffic Most Important

The writer firmly believes that this particular line is one of the most important of the various routes operated by the Shipping Board, as it is to the great continent to the south of us that we must look for a large expansion of our foreign trade. Splendid results in increasing the sale of our goods have already been accomplished, but still greater can and should be developed.

Four steamers are operated to South America, namely the *Pan-American, American Legion, Southern Cross* and *Western World.* It will be remembered that the construction of these 535's was commenced originally with the idea of safely transporting our troops to and from the great battle fields in Europe. As the armistice intervened before any of them were completed, those which had been advanced in construction were converted into combined freight and passenger ships for commercial purposes. They still possess the predominant features of efficient transports, and, as such, are a splendid asset for purposes of national defense. Their speed of 18 knots and better was fixed to make them safe from submarine attack, and their general construction and bulkheading were designed to exceed the rules laid down by the London Conference on Safety at Sea. Hence there is no question but that they are the safest ships which carry passengers on the high seas at this time.

Our Ships Offer Every Inducement to Passenger Trade

These four ships in the South American trade from New York, make it possible to maintain easily fortnightly sailings from each terminus. A round-trip from sailing point to sailing point occupies almost exactly six weeks. The minimum rate to Buenos Aires and return is only $425. Let it be understood that any minimum rate stateroom on these ships is good enough for the most particular traveler, as these large rooms, each provided with two very comfortable beds, not berths, and with the finest lighting and plumbing are comparable to the best rooms on foreign ships.

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With the exception of nine days ashore at Buenos Aires, every cost for the entire six weeks is included in the minimum fare. Where could any one, in these days of high prices, spend a vacation at more reasonable terms? Excellent food, entertainment of all kinds, including "movies" every other night, splendid weather and all the delights of foreign travel are included for the delectation of the traveler, at a total cost of approximately $75 per week. The "splendid weather" is no romance either, for officers of the line who have spent years on this route will testify that not more than three bad days in one trip are encountered in an entire year. Hence the discomforts of sea travel are almost entirely eliminated.

Fair Weather Route

This trip might well be called the "fair weather route," as it is out of the vicinity of all periodic storms, and traverses that portion of the Atlantic where delightfully cool trade winds are the rule rather than the exception. In the coldest part of our northern winters, and within 36 hours from New York, these ships get into balmy weather, where the sea is never rough and sunshiny days follow one another. In the equatorial regions a few tropical showers lend interest rather than discomfort from what would otherwise be a monotonous series of perfect days at sea.

King Neptune's Greeting

Crossing the line is of the greatest interest both prospectively and retrospectively. King Neptune welcomes all Americans who have never before been in his domains. The experience of being initiated into his kingdom is one long to be remembered with most pleasant recollections of the ludicrous incidents of the obeisances paid to His Majesty of the Deep. Each neophyte is furnished with a handsomely engraved certificate of citizenship, after he has gone through the ordeals of naturalization. Hardly has the traveler recovered from the delights of Neptune's visit, the Neptune ball and the Captain's dinner, before he is on the tiptoe of expectation of seeing his first South American port, "Rio in the morning at daylight" is the theme as he turns in on the evening of the twelfth day out from New York. The anticipation of seeing the world's most beautiful harbor is something to cheer up the most blasé and otherwise experienced traveler.

A Scene of Indescribable Beauty

It is not my forte to describe adequately the sensation of getting up just as the sun is rising out of the Atlantic and beholding directly ahead of the ship, the fantastic array of beautiful mountains arising right at the shore line, the white lines of surf pounding at their very bases, and leaping many feet up their granite sides in impotent fury in the age-old battle between sea and land; of the magnificent tropical foliage covering the mountains to their very peaks; of the wonderful panorama of the harbor as you steam slowly through the narrow entrance, guarded on each side by frowning forts; of the beautiful and artistically colored houses and public buildings built on the level portion of the city and up the sides of the mountains; of the navy yard and ships of the Brazilian Navy, the many ships of all nations, and queer looking harbor craft darting in and out at this early hour of the morning. All these must be actually seen, as no amount of description can do justice to this wonderful seaport.

"Rio de Janeiro at last" you say to your neighbor, for heretofore during the passage up the harbor, you are too awe-stricken with the grandeur of the sight to waste time in conversation. The great white ship anchors in the harbor, is surrounded by small craft, the quarantine officer comes alongside, and within an hour you are warped in alongside of a splendid stone quay and begin preparations for going ashore. Your first impression will be the solidity and cleanliness of the docks and their approaches. No slums surround them as in many of our seaports, and within a minute's ride you are on the leading street of the city, the splendid Avenida del Brancho, the Broadway of Rio.

A whirl of sight-seeing around the many places of interest in this delightful city, and at midnight we are off again, viewing the harbor and brilliantly lighted city, under the spell of a moonlit tropical night. Nothing could be more enchanting.

The Southern Cross

To those of us who had never before sailed in the Southern Hemisphere, the gradual sinking of the Polar Star below the horizon, and the eventual disappearance of our old friend the Dipper from the northern skies were of great interest. Their temporary absence from our night gazing was in a manner compensated for by the steady rise of that brilliant constellation, the Southern Cross, famed in prose and poetry.

A comparatively short run of 1,020 miles brings us to the southernmost point of our journey and again at daylight we approach the harbor of Montevideo, the capital of that fine little republic of Uruguay, the traditional friend of Uncle Sam. Soon we are moored alongside a splendid stone quay, and our cargo of automobiles and other manufactured articles consigned to that port is being rapidly unloaded by the very efficient methods in use at these South American ports.

The Rio de la Plata

The Rio de la Plata which empties into the Atlantic at this port, means literally the River of Silver. It might better be named the Rio de la Mud, from its earthy appearance, as it drains a huge area of South America's most fertile soil, and the constant erosion of the soil keeps the water roiled off its mouth for many miles out to sea. It is so broad that the eye cannot reach the other side, even from the channel, which is buoyed for almost the entire distance to Buenos Aires.

Having taken in the many sights of Montevideo, including the several seashore resorts in its vicinity, we leave again at midnight, and retire with our expectations agog with visions of seeing the great metropolis of South America in the morning, as it is only 115 miles away.

At nine in the morning we are abreast of the lower part of Buenos Aires with two tugs at our bow and two at our stern, to insure that we do not go aground in the narrow channel, this being in accordance with Government regulations for vessels of over 10,000 tons. As a matter of fact, our keel frequently drags in the mud, because of the shoalness of the water, which must be frequently dredged to keep it navigable. The usual bright weather enables us to get a splendid view of this remarkable city, and its really enormous docking facilities, built in a series of basins along the entire waterfront of the city.

We enter the Darsens Norte where most of the liners dock, and are rapidly placed alongside the dock by tugs that are handled most skillfully by expert boatmen. Of the many fine tugs and other craft, it is our first impression that all are of European build, the efficient American tug being conspicuous by its absence. Let our shipbuilders take note of this field for their activities.

All incoming passenger liners land at this same wharf where the Custom House is located, which tends to expedite our entry into the city, although if there was anything in our trunks which was not scrutinized by the vigilant Argentine Customs inspectors, we failed to notice it.

Argentina Is a Mecca for Shipping

La Belle Argentine, whom all the nations of the world are wooing is a most wonderful country. With its unsurpassed natural resources, its almost entire absence of man-

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ufacturing plants, its boundless quantities of foodstuffs for a hungry world, it is indeed a Mecca for the ships of all nations. If you would sell to these people, you must buy of their products, and without your own ships you will do neither. Prior to the establishment of the Shipping Board lines to this great South American nation our trade was negligible, notwithstanding that this should have been one of our principal trading places, both from geographical location and a spirit of friendliness engendered by the common interests of our peoples. Now with our own carriers we can enter into this great market with some chance of success, and woe betide our commercial interests if the present American lines are ever abandoned.

Before we had the Munson Line of Government-owned ships, the motor industry for example was practically controlled by Europeans. Now the tide has changed because

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Harbor of Rio de Janeiro

of the quick deliveries and low freight rates on American cars. Hence we rode to our hotel in an American taxi, and were much pleased to note that the majority of the motors seen on the streets are of well-known American makes, the omnipresent "flivver" type being in abundance.

World Market for Argentine's Products

North Americans are welcomed everywhere by the genial, sport-loving and happy people; happy because no Volstead act disturbs their dreams, as they sit at the tables in their sidewalk cafés and partake leisurely of their mild stimulants, of which black coffee forms a substantial part. Why should they worry? The world must have their fat cattle which find so easy a living on their fertile plains, their countless bushels of grain which grows so abundantly, the linseed of which they furnish one-third of the world's supply, the quebracho which tans the hides of which they can furnish unending quantities, and the delicious fruits which their orchards and vineyards produce, while the northern countries are covered with snow.

Ships Hold the Key to this Great Storehouse

No rail routes can bring these products to the markets of the world, nor bring back manufactured articles to pay for them. Ships are the keys to unlock this great southern storehouse, and ships we must have and maintain, if we are to get from our South American brethren our share of their trade. A visit to the hinterland of this great metropolis is one long to be remembered. Fine railroads (under European management) traverse the country. As mile after mile is covered the eye is delighted with the rolling fertile acres, dotted everywhere as far as the eye can reach with herds of the sleekest and fattest cattle browsing on the luscious alfalfa of which they have four crops every year without any care or attention. One story stone or brick estancias, fitted up with every comfort for the fortunate cattle owners dot the landscape. There are no barns or unsightly wooden fences visible. Fences many, but of concrete posts and substantial wire construction. Everywhere a well-kept appearance, with no signs of poverty. Oh! happy land, far from Bolshevism and Soviets, "farm blocs" and other evidences of social unrest.

Nine blithesome days are given the traveler in Buenos Aires, amid the attractions of beautiful parks, a wonderful race track, first class hotels and cafés with the best of food and drink, taxi rides so cheap that one cannot afford to walk, a never-ending number of points of interest, until your money is nearly exhausted and then you set sail again for far off New York.

The Sailing Day a Big Event

Sailing day of a large liner from this port is of more than passing interest. The nationals of the many countries who reside there gather along the water front to see their home vessel sail away with friends and acquaintances, amid the stirring music of bands afloat and ashore, hundreds of streamers of vari-colored paper ribbons reaching from ship to wharf, the cheering of the crowds, the waving of fond adieus as the ship majestically steams out of the basin into the broad reaches of the river. Slowly the magic city fades from view and thoughts are centered on the long voyage ahead of us.

The next morning we are again at Montevideo, where great quantities of jerked beef and other products of the country are loaded by the busy winches. A peculiarity of trade is that the jerked beef is destined for Cuba, and opportunity is taken to ship it on these fast American vessels, in order that it may not be subjected to a long siege of tropical heat as would be encountered on the slower freight vessels. It is transhipped in New York for Havana, and reaches its destination by this circuitous route in better condition and quicker than it would by other and slower means of transportation.

Loading Coffee at Santos

After visiting places in Montevideo which had been overlooked on the first visit, we leave that busy port in the early evening, and soon the ship's bow is headed northward up the coast. On the home voyage all of these American ships stop at the busy port of Santos, the seaport of Sao Paulo, which is located in the hills about 50 miles from the sea. Santos is approached from the rear, by steaming up a narrow river about five miles. It is said that out of this port is shipped two-thirds of the entire supply of coffee in the world.

Here again are splendid stone quays, with the most efficient loading apparatus imaginable. The coffee is loaded from storehouses hundred of yards away from the ship by an endless belt, and comes aboard in sacks so silently that one would not know the ship was being loaded. Bags of this staple breakfast necessity follow in an endless procession at the rate of nearly one per second. Three or four bronzed stevedores seem sufficient to have it properly stowed in the capacious holds of the ship. Some 20,000 bags were loaded in five or six hours after the stream was started.

A Manufacturing Center

In the meantime many passengers visit the delightful city of Sao Paulo up in the hills, where the air is cool and bracing. This beautiful place seems destined to be the principal city of Brazil. Not only is it the coffee center of the country, but it is rapidly assuming prominence as a manufacturing center, where really excellent shoes are turned out in great quantities. Other passengers who have not taken this ride up in the hills, have found amusement and recrea-

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tion in visiting several nearby bathing beaches. All are aboard and ready to sail at 11 o'clock in the evening.

After one of the very few warm nights at sea we are again at the entrance of the world's most beautiful harbor, Rio de Janeiro, and are ashore by noon. More sight-seeing, shopping, visiting friends, dining at some of the fine hotels, visiting the exposition, etc., occupy our time for the 24 hours' sojourn in this Paradise of the South.

At exactly noon on the following day amid similar scenes of farewell as those at Buenos Aires, we leave the hospitable shores of South America for the long homeward bound trip. Every stateroom is filled, showing that American ships are still popular despite their dry reputation. As one Briton expressed it, "Better to have flowing water in the baths, than flowing stimulants at the bar."

South Americans Patronize our Ships

Over one-third of the passenger lists are South Americans who mingle with their North American brethren on terms of the greatest amity and friendship. By the third day out incipient outbreaks of English-Spanish and Spanish-English are heard, and it is conceivable that if the voyage had lasted for a couple of months all would have been conversing in both English and Spanish in an understandable manner. Dances every evening, shuffle board, deck quoits and tennis, walking matches, boxing bouts, and horse-racing help to wile away the time, so that each passenger seemed to regret the passage of every day instead of being afflicted with ennui.

The Game of Horse-Racing

This horse-racing at sea is indeed a novelty and enjoyed by nearly all. Courses of various lengths are laid out on deck, and miniature horses each numbered from 1 to 6 respectively, champ at their bits ready to move a portion of the course, as their numbers are thrown on the dice rolled by volunteers from the passengers. Sometimes the numbers are called out in English and sometimes in Spanish, but all who had bet the munificent sum of 25 cents on their favorite horse could understand "cinco" and "five" or any other numeral up to six. Exciting finishes frequently occurred causing volumes of cheers which must have surprised the flying-fish in the vicinity.

The Dipper once again resumes its place in the firmament, shortly to be followed by the reappearance of Polaris, while the Southern Cross gradually passed from view as the steady 17½ knot pace of the good ship ate up the degrees of latitude on our northwesterly course. Clear skies, indigo waters ruffled by cooling trade winds featured every day, and we were before long approaching the latitude of the Bermudas, which on the tenth day out from Rio, were passed, plainly in view, about 9 miles off.

In the latitude of Hatteras on the following day, we awoke to find the ship rolling violently and running with a screeching southeast gale, which at times assumed a velocity of 50 miles per hour. Any one who doubts the seaworthiness of these 535's should have seen this ship in action. Aside from an occasional swish of spray, the decks fore and aft are dry. It is doubtful if a single soul on the ship was seasick, as all by this time had on their "sealegs," and the blow was a delightful change after the monotony of fine weather.

The End of a Delightful Trip

Turning in Sunday night, with the hoarse whistle sounding warnings in a dense fog and rain, we awoke at three the following morning, and found the ship serenely anchored off Quarantine at Staten Island, with a bright moon shining in a cloudless sky. We also awoke to the cold realization that the most delightful trip of our experience had ended, and that we must resume the monotonous existence of wrestling for a living.

The trip up the harbor was a delight to our Argentinian shipmates, who eagerly searched for the Statue of Liberty, the Woolworth Building, the Battery, Broadway, but of all things those most wonderful skyscrapers of which they had read and dreamed for many months.

By the inquisition of our benevolent Government in the shape of numerous quarantine, immigration and customs officials, and we are once more in the Land of the Free, our first inquiry being "have they settled on a Shipping Policy yet?"

Whatever is done for shipping, we all unite in praying that the South American lines must be kept up and continually expanded.

E. P. Farley Appointed Chairman of Shipping Board

(*Continued from page* 324)

with the idea of keeping in business operators who might become purchasers, if conditions for operation on their own account were made more favorable by the adoption of the subsidy plan. It has been understood for some time that direct Government operation probably would involve the employment directly by the board of ship crews and officers and the payment of brokerage fees to ship brokerage firms for cargoes obtained for the Government vessels. It has also been the idea that a number of the present managing operators would be used as brokers, as many of them were formerly engaged in that business.

Extension of the coastwise laws to the Philippines will not be seriously considered until the question of whether or not there is to be direct Government operation has been definitely determined, but, if the Government remains in the shipping business, it would expect to be a favored carrier in that service.

Bids Asked for Ships

Bids for the Government's passenger and cargo ships were to be received up to May 28, according to a call issued by the board on April 28. Bidders were requested to enter into an agreement to maintain line service on one or more of 18 routes named by the board, or such other routes, acceptable to the board, as might be proposed by the bidder.

The proposed 18 services which were published in our May issue were suggested for the purpose of eliminating overlapping or duplication and also so that each service would include a reasonably wide range at each terminus, thus affording larger markets from and to which to take cargo. The board, however, will consider any service proposed, if the bidder will guarantee to operate for a specific period over the routes selected by him. Further, the board will agree upon the acceptance of any tender not to operate Government owned ships in competition with him while adequate service is maintained.

Reconditioning Contract Approved

President Harding on May 8 approved the action of the Shipping Board in awarding the contract for the reconditioning of the *President Buchanan* to the Newport News Shipbuilding and Drydock Company instead of to the Brooklyn navy yard, in spite of protests made by the Brooklyn Chamber of Commerce, the navy yard and the American Federation of Labor. The President acted after requesting a report from the Shipping Board, which showed that the navy yard had not submitted a firm bid but only an estimate and that if the cost exceeded the estimate the board would have to pay the additional cost. It was also pointed out that if the *Leviathan* reconditioning job had been made on the basis of a navy yard estimate the cost would now be about $1,200,000 higher than it was because the Newport News company had found its costs to be about 15 percent higher than its bid.

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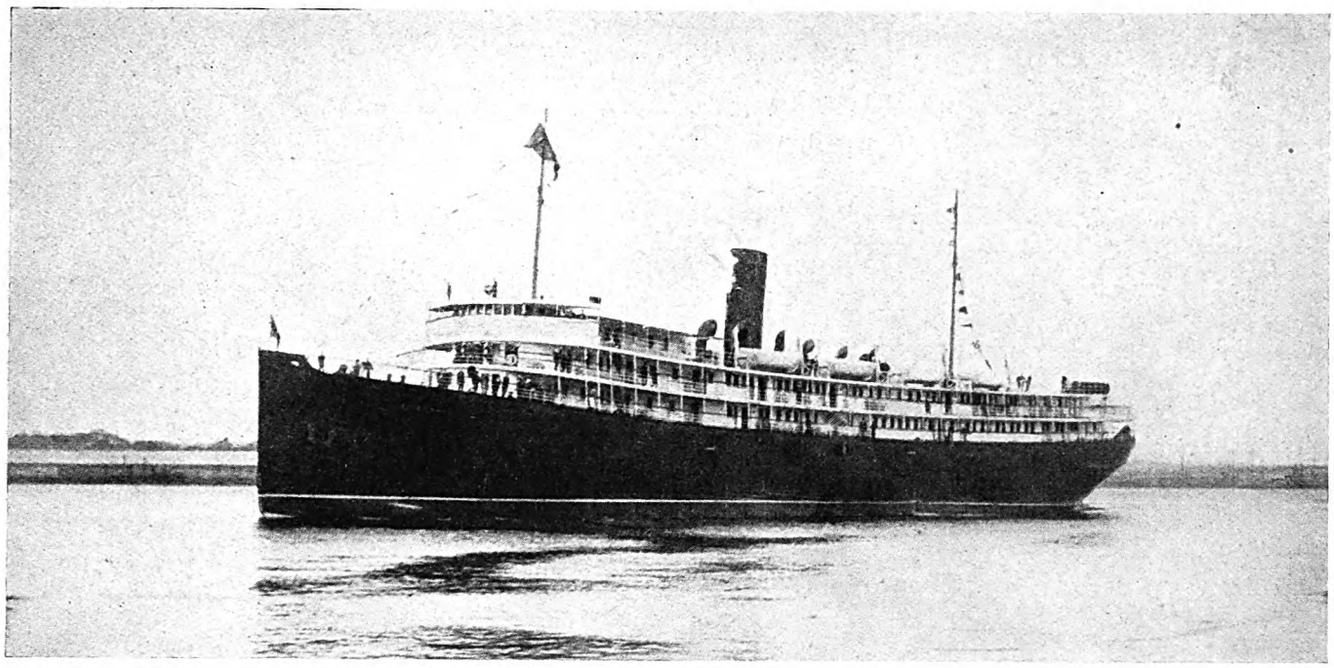

Passenger and Freight Steamship Alleghany

New Coastwise Steamships Alleghany and Berkshire

Passenger and Freight Vessels for the Merchants and Miners Transportation Company Combine Comforts and Conveniences of Ocean Liners with Efficient Cargo Handling Arrangements

ONE concrete illustration of a happy combination of efficiency and economy is to be found in the new steamships recently completed by the Federal Shipbuilding Company, Kearny, N. J., for the Merchants and Miners Transportation Company of Baltimore. One of these vessels, the *Alleghany,* is now in service between Baltimore and Jacksonville, via Savannah, and the other, the *Berkshire,* will trade between Philadelphia and Jacksonville, via Savannah.

As might be expected from a steamship company that has been established since 1854, efficiency has been the prime object in the construction, equipment and appliances of these vessels. The passenger accommodations have been studied from the standpoint of comfort, convenience and cleanliness rather than lavish adornment. All the latest devices for insuring the safety of life at sea have been adopted. The question of quick despatch in loading and discharging cargo has been solved by the installation of labor-saving appliances for handling freight, including bulky automobiles of all types.

Principal Dimensions

The principal characteristics of the *Alleghany* and her sister ship, the *Berkshire,* are as follows:

Length overall	368 feet 0 inches
Length between perpendiculars	350 feet 0 inches
Beam, molded	52 feet 0 inches
Depth to main deck	27 feet 3 inches
Depth to hurricane deck	35 feet 0 inches

These steamships have steel hulls, single screws and are what is called the "hurricane deck" type of combination passenger and freight vessels. They have straight stems, elliptical sterns and are schooner rigged with two steel pole masts. There are four steel and two wood decks with a steel deck house on the hurricane deck and wood deck houses on the promenade and boat decks.

Constructed on the Isherwood System

The hulls are built on the Isherwood system of ship construction with scantlings, workmanship and material in accordance with American Bureau of Shipping class + A 1 E. The stem is a rolled steel bar having a scarph at the lower end; the stern frame is a wrought iron forging constructed in two pieces with suitably located scarphs and with the rudder and propeller posts extending into the hull to give good connections to the floors.

The rudder is of the single plate type, built up, with a wrought iron post and wrought iron arms opposite each pintle. The pintles are of steel having brass casings and working in lignum-vitæ bushings in solid forged gudgeons. The weight of the rudder is supported on a cast iron bearing, lined with white metal and fitted with a brass bearing ring and a cast iron supporting collar made in halves.

Structural Details

As may be seen from the drawings accompanying this article, the double bottom extends from the fore peak bulkhead to the after peak bulkhead. The center vertical keel which divides the inner bottom fore and aft is 43 inches deep. One intercostal longitudinal girder is placed on each side of the center vertical keel but in the way of the engine room and in the forward end of the vessel, additional intercostals are fitted.

The framing consists of channels running fore and aft

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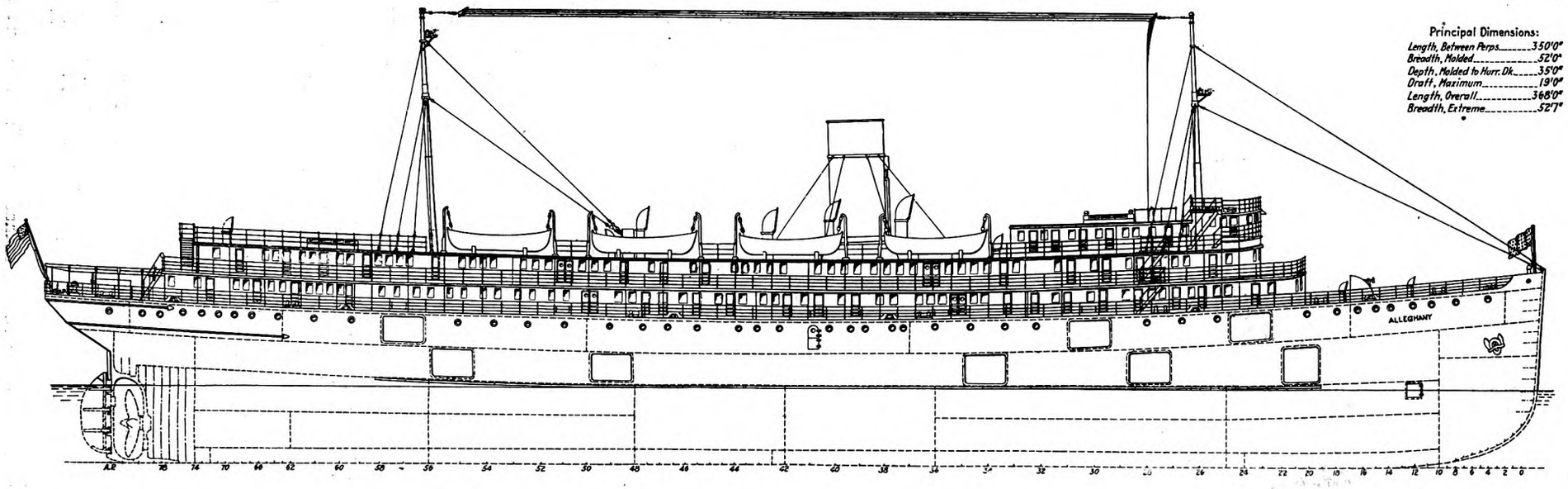
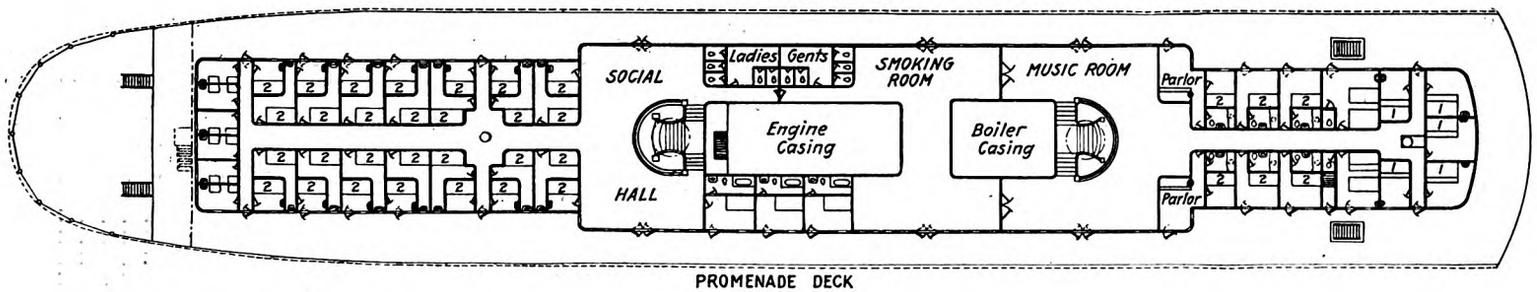
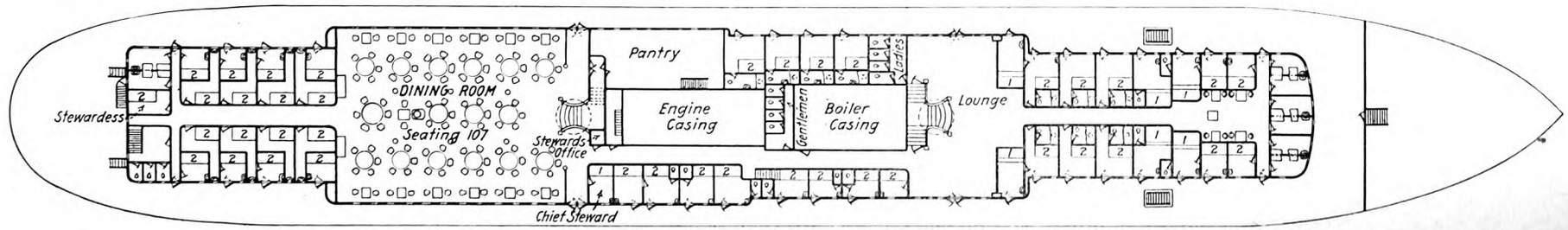




PROMENADE DECK



HURRICANE DECK

General Arrangement Plans of the New Coastwise Steamship Alleghany

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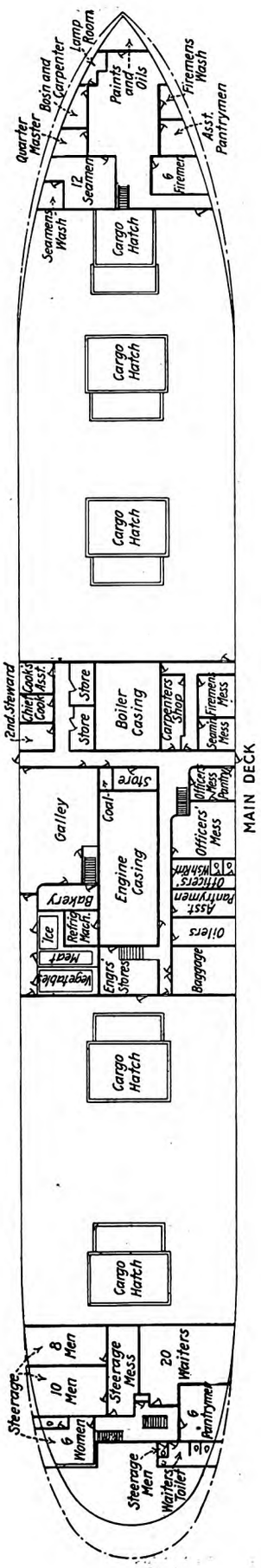

Plan of Main Deck of S. S. Alleghany

on the Isherwood system and reinforced by transverse belt frames. The boat and promenade decks are supported by transverse deck beams but the four structural steel decks are framed with bulb angle deck longitudinals supported at widely spaced intervals by transverse beams in accordance with the regular Isherwood design. One row of widely spaced tubular pillars is fitted under the orlop, lower, main and hurricane decks. Special pillaring is constructed under masts, winches, windlass and steering gear.

BULKHEADS

Six bulkheads subdivide the vessel into watertight compartments. Four of these bulkheads extend to the lower deck while the forward and after peak bulkheads extend to the main deck. A watertight door, operated far above the waterline, is fitted in the after engine room bulkhead for access to the shaft alley. A strong steel dust-proof non-watertight bulkhead with a door is fitted between the engine and boiler rooms.

ACCOMMODATIONS

The boat deck, which is constructed of 1⅛-inch tongued-and-grooved white pine and covered with canvas is laid on yellow pine carlins and is carried to the vessel's side forming the top of the promenade deck. The pilot house is located on the forward end of this deck on a raised platform which extends to the ship's side forming the bridge. The top of the pilot house extends 24 inches above the boat deck house providing for an unobstructed view aft through plate glass windows. The forward end of this house is well rounded having closely spaced windows with fixed lower sashes of 3/16-inch plate glass in oak frames. The upper sashes are of the sliding balanced type.

The pilot house is heated by a brass pipe coil around the forward end. All hardware and appliances in this room are of brass.

Among the instruments installed in the pilot house are a McNab direction and revolution indicator which shows exactly what the engine is doing, a Lord Kelvin compensating binnacle with a 10-inch card and compass, a double faced repeating telegraph, 12 inches in diameter, a loud-speaking telephone to the engine room, the usual whistle pull and an automatic control for the whistle, tell-tales for masthead, running and stern lights, the operating equipment for a submarine signal apparatus, an alarm board from the pneumatic tube, electrical indicating fire alarm system installed throughout the staterooms, a smoke indicating system which reveals the slightest fire in the cargo holds, the usual barometers, thermometers, clocks, night glasses, megaphones, etc.

Passing to the life-saving apparatus on this deck, there are seven metallic lifeboats, each capable of carrying 42 persons and one motor boat having a capacity for 33 people. Eight Jacob's ladders having a length equal to the distance of the boat deck above the light water line are stowed on this deck.

The officers' quarters are located on the boat deck. They are finished in white and paneled with Vehisote. Each room is fitted with a white pine paneled door and with a brass wire Venetian screen door. The captain and chief engineer are each provided with a double bed and the remaining officers with metal berths of the wall type.

PROMENADE DECK HOUSE

The promenade deck house is constructed of wood and contains in addition to the staterooms, public toilets, etc., a music room, a smoking room and a social hall. The sills, posts and stanchions are of yellow pine. The outside is paneled with 1⅛-inch white pine and inside with 1-inch white pine sheathed with Vehisote. All weather doors are of white pine with oak Venetian brass wire screen doors inside.

The music room has double entrance doors, including screen doors fitted on each side, furnished in cane mahogany with tapestry upholstery. An artistic circular skylight located over the main stairway is finished in harmony with the interior work.

This room is carpeted and furnished with a piano, comfortable chairs, sofas and tables.

Aft of the music room is the smoking room. This is a very pretty room finished in cherry strained mahogany with a paneled ceiling. The floor is laid with rubber tiling fitted in large squares. Double entrance doors open on each side to the promenade deck and access is also provided to the quarters fore and aft. This room is furnished in mahogany with leather upholstery.

On the after end of the promenade deck is a social hall with a circular skylight finished to suit the interior. A striking feature in all the public rooms on this deck is the drinking fountains fitted with spring cocks which supply cold running drinking water. The social hall is furnished with reed furniture with tapestry upholstery.

The hurricane deck house is constructed of steel and contains, in addition to the staterooms, the dining saloon, pantry and a lounge furnished in mahogany with tapestry upholstery. The dining saloon has a seating capacity for 107 persons at tables arranged to seat 2, 4, 5 and 6 people. Mahogany tables with hinged storm guards and mahogany chairs, upholstered in hair and leather, together with two large mahogany buffets having large beveled edge mirrors give this public room a cheerful and rich appearance. The floor is laid with Lit-o-Sil-o and covered with Beaver Tile.

At the forward end of this deck is the lounge ex-

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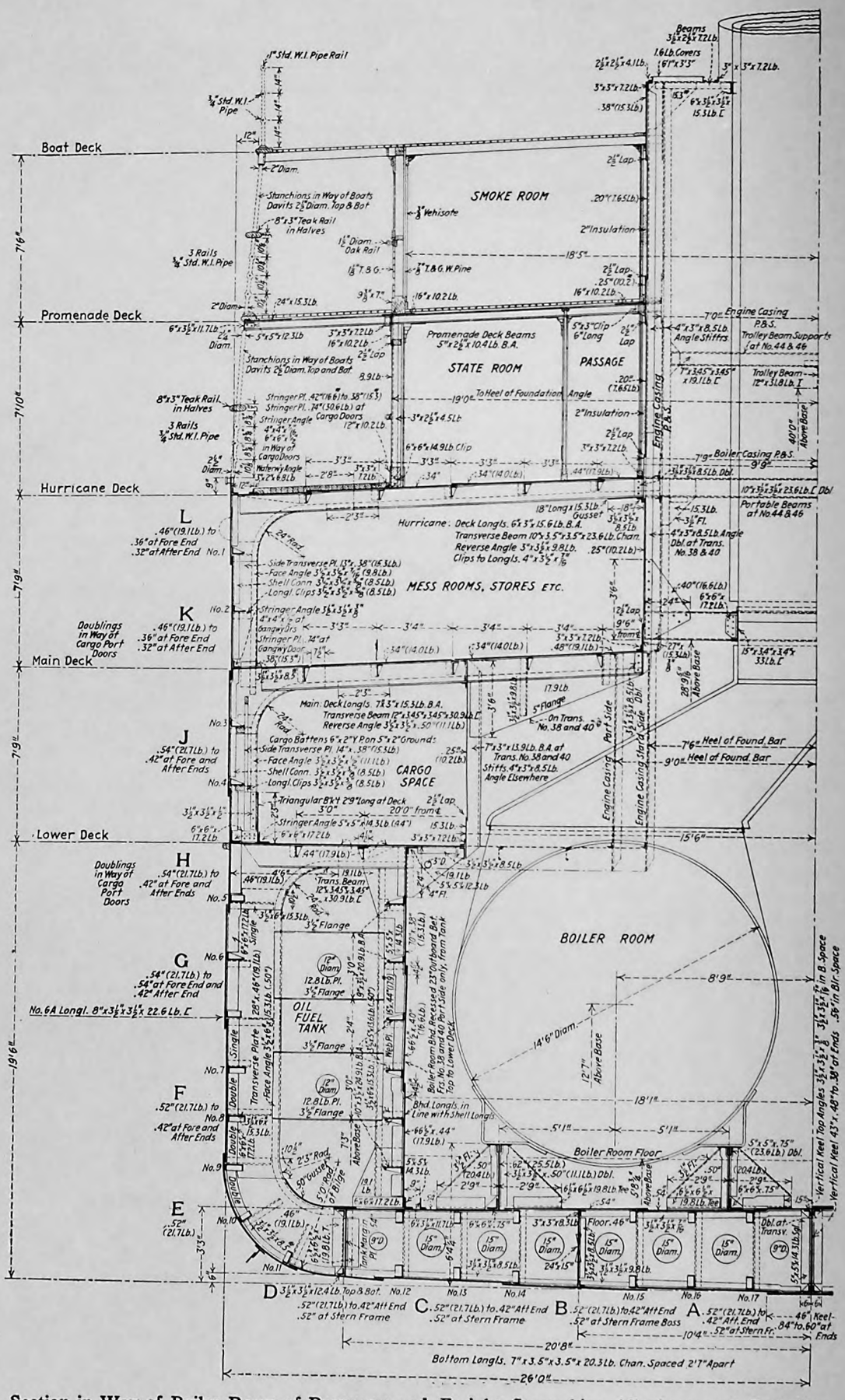

Section in Way of Boiler Room of Passenger and Freight Steamships Alleghany and Berkshire

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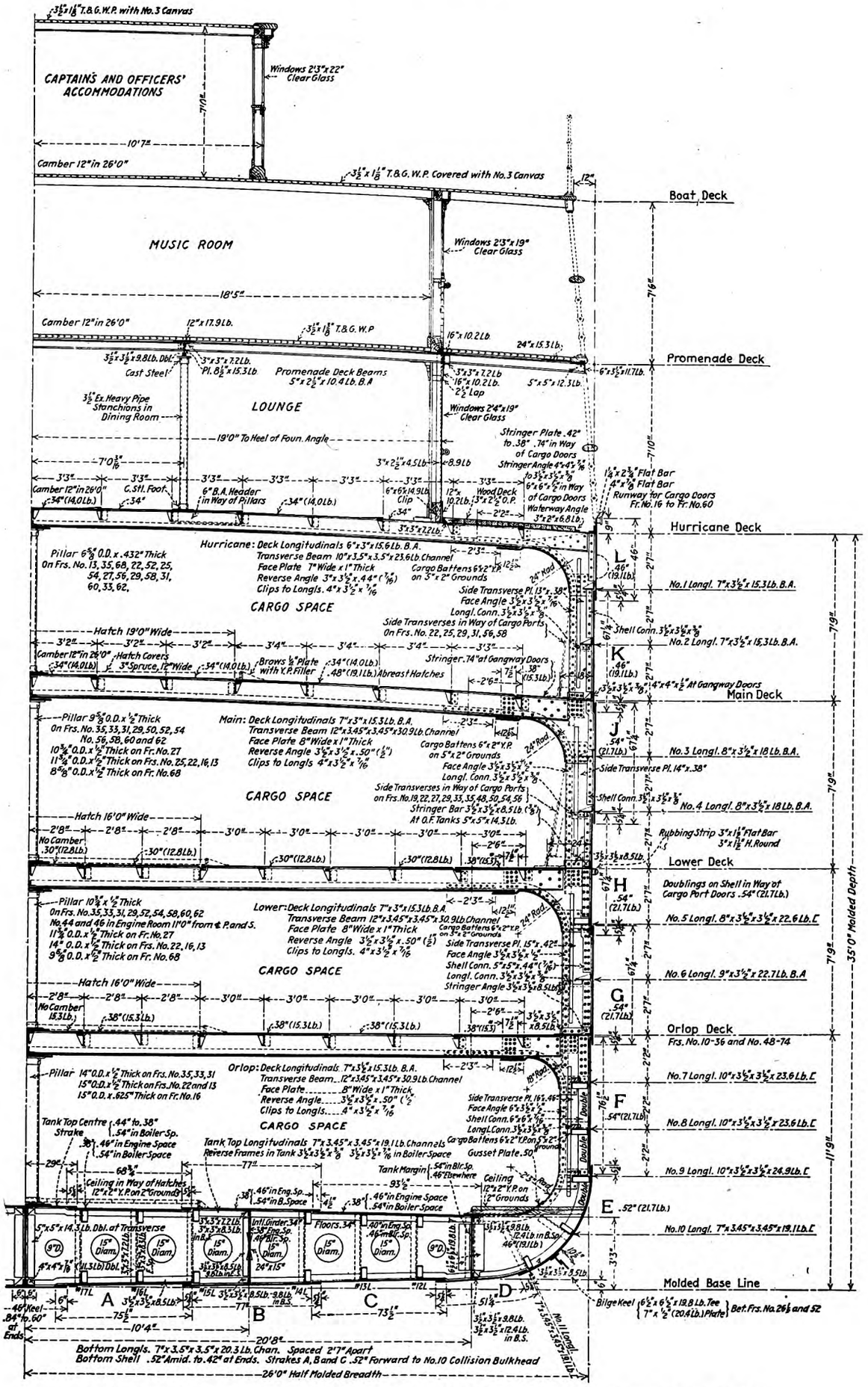
CAPTAINS AND OFFICERS' ACCOMMODATIONS
MUSIC ROOM
LOUNGE
CARGO SPACE
CARGO SPACE
CARGO SPACE
CARGO SPACE
Boat Deck
Promenade Deck
Hurricane Deck
Main Deck
Lower Deck
Orlop Deck
Molded Base Line
Hurricane: Deck Longitudinals 6"x3"x15.6 Lb. B.A.
Main: Deck Longitudinals 7"x3"x15.3 Lb. B.A.
Lower: Deck Longitudinals 7"x3½"x15.3 Lb. B.A.
Orlop: Deck Longitudinals 7"x3½"x15.3 Lb. B.A.
Bottom Longls. 7"x3.5"x3.5"x20.3 Lb. Chan. Spaced 2'7" Apart
Bottom Shell .52" Amid. to .42" at Ends. Strakes A, B and C .52" Forward to No.10 Collision Bulkhead
26'0" Half Molded Breadth
35'0" Molded Depth

Midship Section of Passenger and Freight Steamships Alleghany and Berkshire

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General Data: Steamships Alleghany and Berkshire

General Information

Service: Coastwise.
Builder: Federal Shipbuilding Company, Kearny, N. J.
Owner: Merchants' & Miners' Trans. Co., Baltimore, Md.

Characteristics

Length, overall	368' 0"
Length, B. P.	350' 0"
Breadth, molded	52' 0"
Depth, molded to hurricane deck	35' 0"
Draft, loaded	19' 0"
Draft light, mean	11' 0"
Block coefficient	0.70
Speed, loaded, knots	12
Cruising radius, nautical miles	4,600
Framing	Longitudinal
Class	+ A. I. E. American Bureau of Shipping

Tonnages

(In tons of 2,240 pounds)

*Weight of hull	3,000
**Weight of propelling machinery	650
Deadweight capacity	3,300
Displacement	6,950
(In tons of 100 cubic feet)	
Gross register	5,486
Net register	3,261

*Weight of hull includes hull proper, hull fittings, equipment, and outfit.
**Weight of propelling machinery includes engines, boilers (wet), shafting, propellers, and machinery space auxiliaries.

Equipment

Anchor	Bower	Stockless	6,580 lbs.
Anchor	Bower	Stockless	6,580 lbs.
Anchor	Bower	Stockless	5,600 lbs.
Anchor	Stream	Stockless	2,415 lbs.
Chain	270 Fath., 2⅛"	Stud Link	

Rudder

Area	99 sq. ft.
Dia. stock	9"
C. press. abaft C. L. pintles	3' 1"

Complement

Deck officers	6
Deck crew	10
Engineer officers	4
Engineer crew	9
Purser's and steward's department	41
Total officers and crew	70
First-class passengers	205
Second-class passengers	24
Total passengers	229
Total complement	299

Handling Equipment

	No.	Type	Capacity	Length
Masts	2	Steel	Wireless	....
Derrick posts	10	Steel	2½ ton 'tween dk.	

Deck Machinery

(Number, Size, Type)

Steering Gear	Hyde, Drum Type, 9"x9"
Windlass	Hyde, Spur Gear, 9"x10"
Capstans	2—8"x8" Hyde
Winches	10 Lidgerwood Twin Cylinders, 8¼"x8"

Life Saving Equipment

Lifeboats	No.	Type	Length
40 persons	7	Steel	....
33 persons	1	Steel Motor	....

Propelling Machinery

Boilers

Number	4
Type	Scotch, Single Ended
Length	11'-2¼"
Diameter	14'-3"
Furnaces	3 Furnaces, each boiler 42" dia.
Fuel	Oil, White
Draft	Howden forced
Total heating surface, square feet	9,216
Total grate surface or furnace volume	231 sq. ft.
Working pressure, lbs. per sq. in.	200
Normal fuel consumption:	
Per day, tons	36
Per horsepower hour, pounds	1.25

Engines

Number	One
Type	Reciprocating, 4 cylinder
Size	24½ x 41½ x 54 x 54—48 triple
Horsepower	2,700 I. H. P.

Propellers

Number	One
Type	4 bladed, built up
Diameter	16' 6"
Pitch	17' 6"
R. P. M.	81.1
Projected area	85.5 sq. ft.
Developed area	97.1 sq. ft.

Auxiliary Machinery

(Number, Size, Type)

Machinery Space
Condensers, 2 main and auxiliary.
4,000 sq. ft. surface.
800 sq. ft. surface.
Evaporators, one 20-ton Reilly.
Distiller, none.
Filters, one.
Feed water heater, one No. 18 type D Reilly.
Fuel oil heaters, two White Type B.
Pumps:
One 12 x 26 x 18 vertical twin air.
Two 14 x 9 x 24 vertical feed.
One 9 x 6 x 12 vertical aux. feed.
One 12 x 8½ x 12 vertical duplex ballast.
One 12 x 8½ x 12 vertical duplex fire.
Two 7½ x 6 x 10 horz. duplex sanitary.
Two 6 x 6 x 6 vertical duplex oil and bilge.
Two 5¼ x 5 x 5 vertical duplex F. W. pumps.
Two 5¾ x 4 x 8 vertical duplex fuel service.
One 4½ x 3¾ x 4 horz. duplex hot water.
Two 3 x 2¾ x 3 horz. duplex ice water.
One 4½ x 4 x 4 vertical duplex evp. feed.
Two 7½ x 5 x 6 horz. duplex D. K. service.
One 10 x 12 x 12 horz. aux. air and circ.

Refrigerating Machinery
One 2 ton Brunswick double condenser capacity.

Electric Equipment
Generators, two 50 K.W., one 15 K.W. General Electric.
Radio, one 2 K.W.
Emergency, batteries.

Holds

No.	Length	Hatches
1	52-0	13-0 x 19-0
2	71-6	13-0 x 19-0
3	50-9	13-0 x 19-0
4	57-7	12-0 x 19-0

Capacities

Cargo Space

Compartment	
No. 1 hold	11,930
No. 2 hold	25,634
No. 3 hold	13,339
No. 4 hold	5,366
No. 1 orlop 'tween deck	13,748
No. 2 orlop 'tween deck	25,094
No. 3 orlop 'tween deck	18,462
No. 4 orlop 'tween deck	18,426
Upper 'tween deck	113,151
Forward main 'tween deck	35,507
Aft main 'tween deck	26,462
Total bale capacity	307,319 cub. ft.

Refrigerated Space

Compartment	Cu. Ft.
Ice	278
Meats	327
Vegetables	532

Bunkers

Compartment	Tons
Port settling	120
Starboard settling	130
Inner bottom No. 3	120
Inner bottom No. 2	204
	574

Tanks

Compartment	Cu. Ft.	Tons F. W.	Tons S. W.
Fore peak	92		94
No. 1 inner bot	62		..
No. 4 inner bot	115		..
No. 5 inner bot	..		122
No. 6 inner bot	..		45
Aft peak	56		58

tending the full width of the house. A large hardwood stairway, fan-shaped at the bottom leads to the music room above.

Staterooms

Four staterooms at the forward end of the hurricane deck house and six at the forward end of the promenade deck house are fitted with double metal bedsteads and with a single metal berth above. There are also 41 two-berth and 8 one-berth staterooms in the hurricane deck house and 40 two-berth and 6 one-berth staterooms in the promenade deck house.

Every stateroom is furnished with a washstand fitted with running hot and cold water. Nothing has been overlooked to make these rooms exceptionally comfortable in every respect, even to providing berth lights similar to those used in Pullman sleeping cars so that one can read easily in bed.

Plumbing

On the promenade deck there are three bathrooms fitted with porcelain tubs and six shower rooms connecting to staterooms and on the hurricane deck 10 shower rooms connecting to staterooms. Running fresh and sea water is supplied to all baths and the showers are provided with a special thermostat valve which prevents any possibility of anyone accidentally scalding himself. Mosaic tile is laid on the floor over sheet lead and in the way of showers up the sides. Elsewhere the walls are covered with Vehisote tiling treated with waterproof enamel.

Saloon Pantry

The pantry is located just forward of the dining saloon on the port side. Access is provided by double doors direct from the saloon. The floor is laid with mosaic tiling and the walls are covered with Vehisote tiling. Included in the equipment are the following: A seamless cast iron Vortex dishwashing machine, a battery of 5-gallon heavy nickel-plated copper coffee urns, a combination urn stand, cup warmer and drainer, a three-bucket egg turner and cooker, a nickel silver top steam table, 9 feet 6 inches by 30 inches, an automatic bread toaster and an 18-inch by 36-inch electric griddle.

Galley

The galley is located on the main deck almost directly below the pantry. The floor is laid with brick efficiently drained and the ceiling insulated with mineral wool and galvanized sheet steel. The equipment here consists of a steel plate galley range containing three fires and four ovens,

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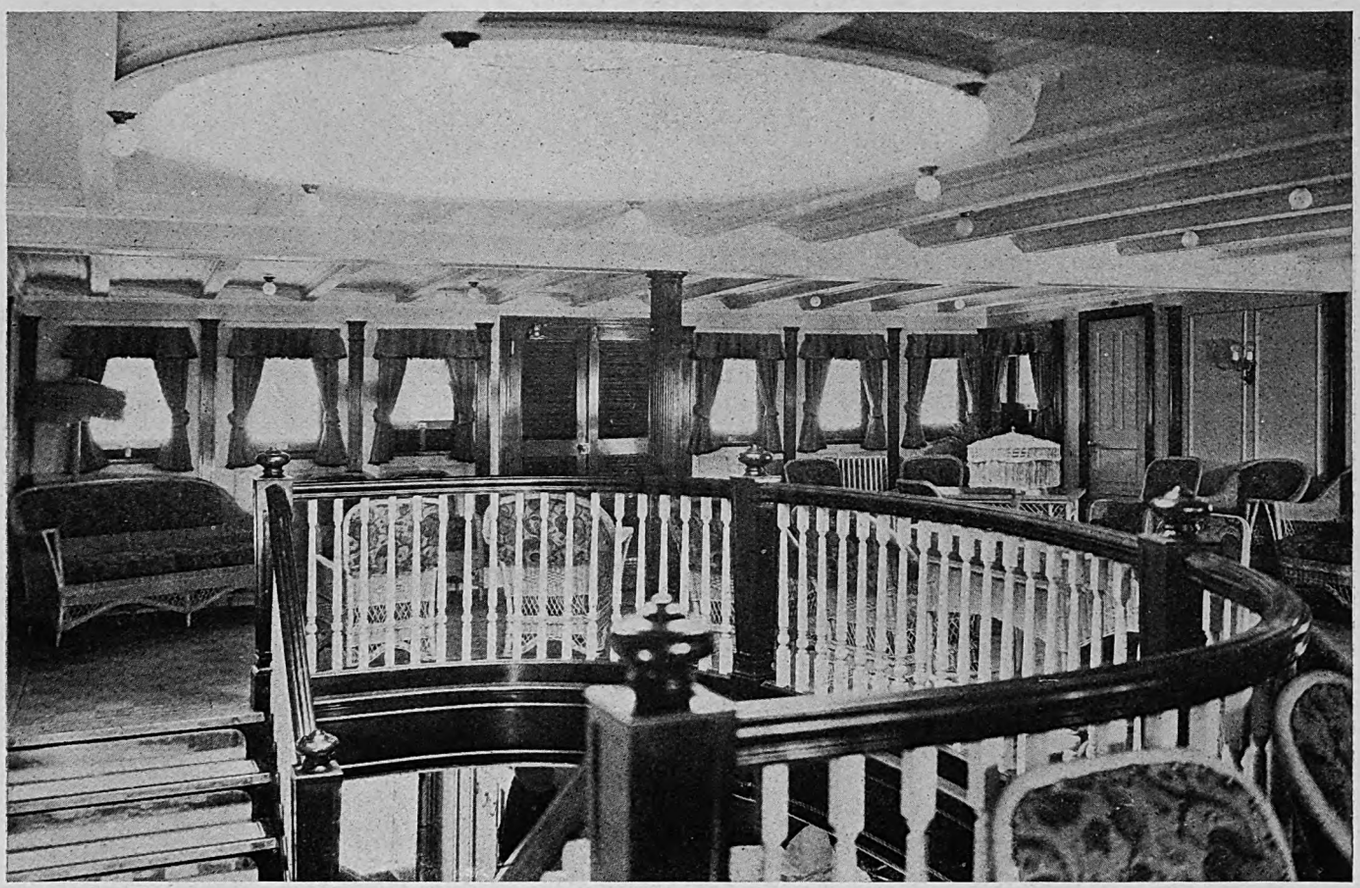
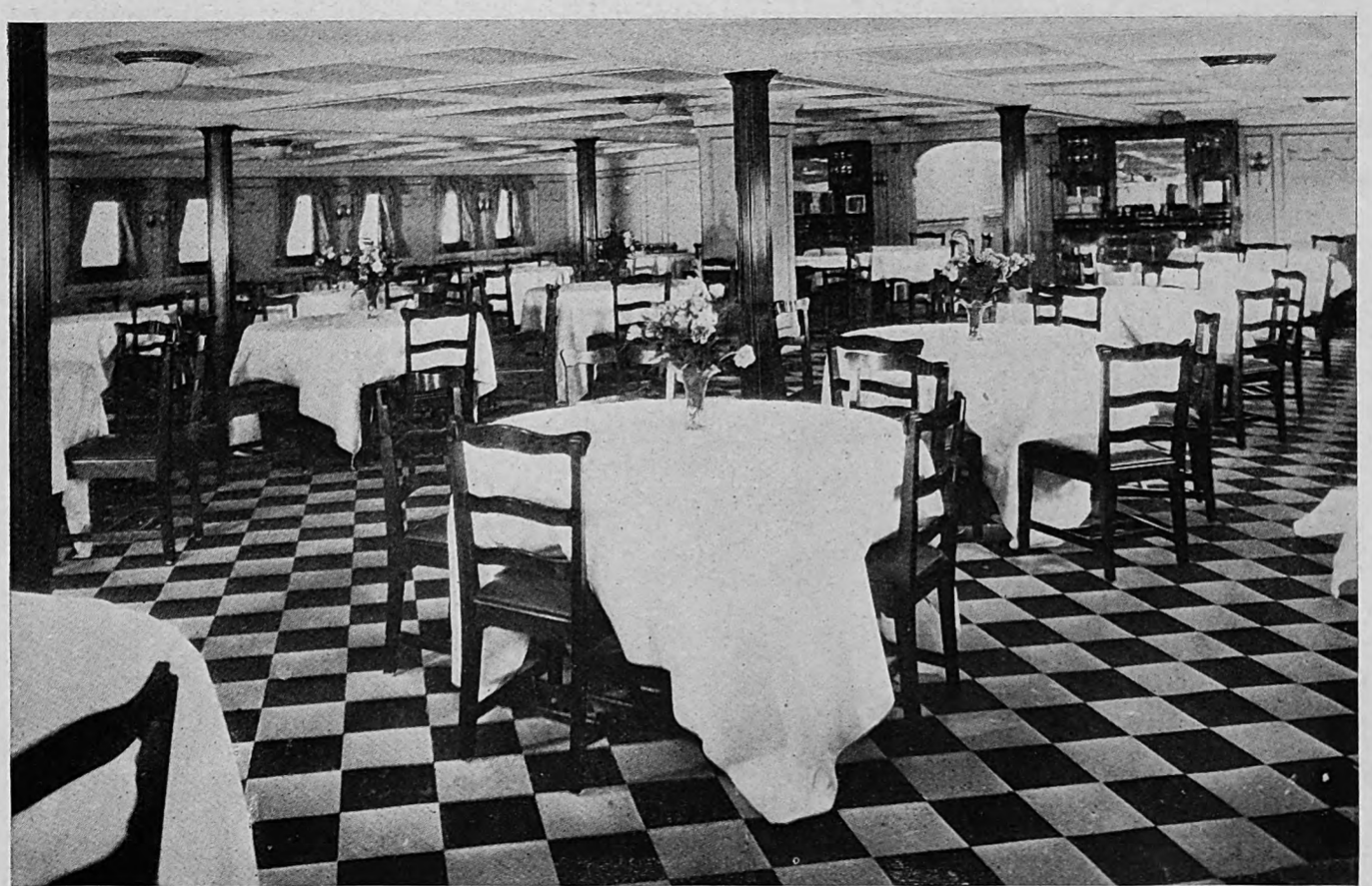


Social Hall



Dining Room

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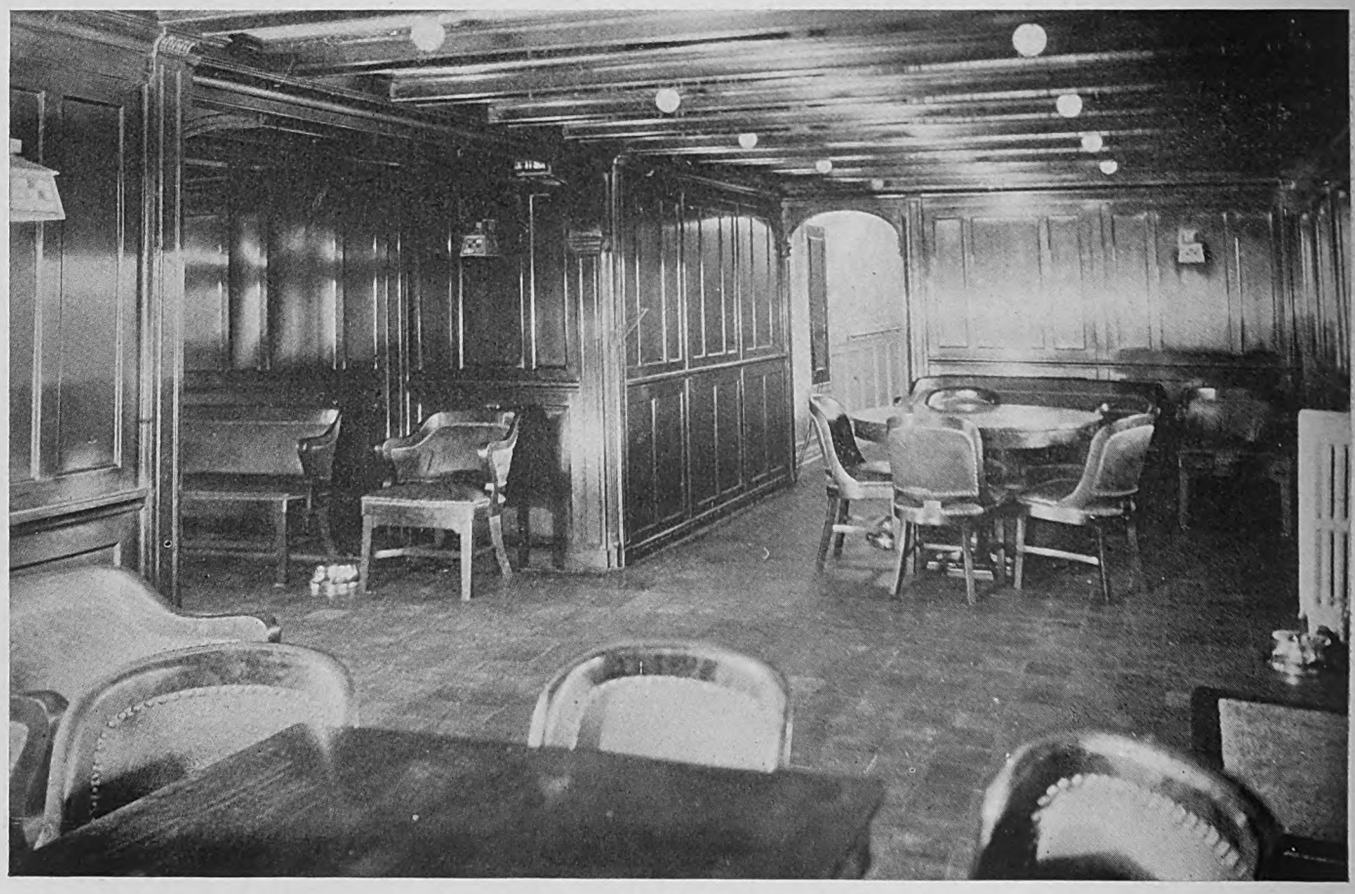
Lounge



Smoking Room

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an upright vegetable steamer, a 25-gallon aluminum double jacketed steam stock and soup kettle, a 16-inch vegetable peeler with carborundum-lined body and revolving disk, a steam press or warmer and a coke bake oven having a capacity of 60 one-pound loaves of bread.

An exhaust system of ventilation is provided for the staterooms, public spaces, pantry, galley and public toilets. Telephones are installed in each room.

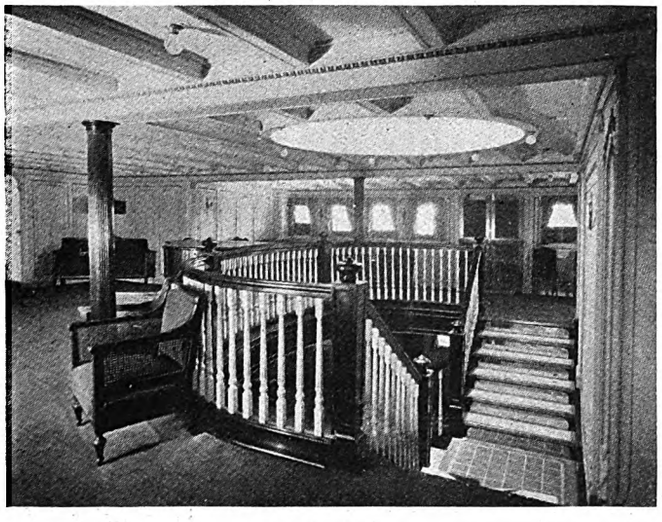
CARGO PORTS

For quick and efficient loading and discharge of freight the ship is provided with 3 watertight cargo ports on each side of the main deck. These ports are 10 feet by 6 feet 7 inches in the clear. On the lower deck there are five watertight cargo ports ranging from 9 feet by 8 feet to 10 feet by 7 feet in the clear. These ports when opened are suspended by chains from trolleys running on a flat bar rail at the gunwale. One lumber port about 4 feet by 3 feet 6 inches is also fitted on each side of the vessel just aft of the forward peak bulkhead.

It may be said at this point that the principal revenue of this line comes from the carriage of freight and that every effort has been made to expedite its handling. The character of the freight is such that it cannot be safely stowed for great depths without damaging the underneath portions, so four complete steel decks have been fitted. The five hatches are served by jib cranes and winches, two being located at each hatch.

PROPELLING MACHINERY

The main propelling machinery consists of four single ended, return-tube Scotch boilers fitted with the Todd oil burning system and Howden forced draft and one 4-cylinder direct acting triple expansion engine of the Hooven-Owens-



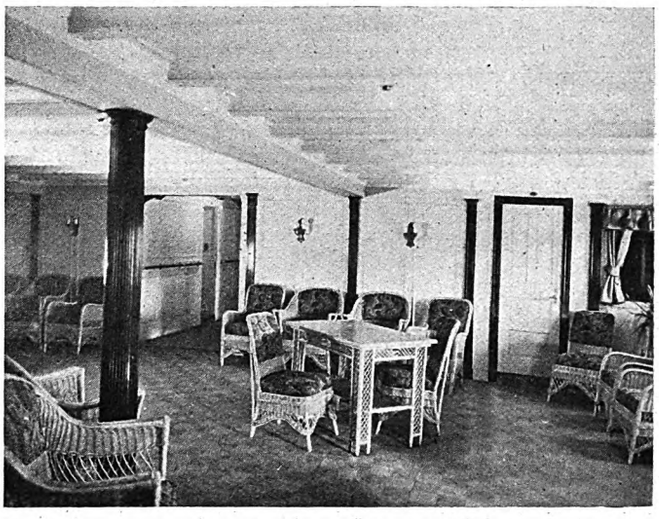
Music Room

Rentschler type. The propeller is of the built-up class having four right handed blades.

Complete information relating to the auxiliary machinery is tabulated on the data sheet accompanying this article, but there are several points on which comment can be made. The pumps which were supplied by the Warren Steam Pump Company, with the exception of the fuel oil feed pumps, have their pump cylinders of Government bronze. The fuel oil pump cylinders are of iron. All the vertical pumps have piston rods of the divided type; that is, the steam end of steel and the pump end of Tobin bronze. These rods are joined by heavy crossheads and caps of forged steel. The main air pump has two steam and two air cylinders and the cylinder connections are so arranged that in case either steam cylinder becomes disabled it can be cut off and the pump run on the opposite cylinder.

ECONOMICAL SPEED

Referring to the horsepower of the engine and the speed of the ship, it has been ascertained that here again the principles of economy and efficiency have been coordinated to



Corner of Social Hall

the fullest extent. A higher speed could not have been obtained except at a sacrifice of cargo-carrying capacity through finer lines and increased weight and cost of machinery. As desirable as high speed may be in the usual passenger trades, in this case there is no advantage as the speed was determined so that the vessel would arrive at her terminal ports early in the morning, thus giving the stevedores a full day to load and discharge. As can easily be seen there would be no advantage in arriving at a port before daylight and it would be impossible to increase the speed sufficient to cut off 24 hours in her sailing time, which condition would be required in order to obtain the full day for the stevedores.

All in all these ships represent the latest and most modern type of vessels in the Atlantic coastwise trade, having comforts and conveniences for the passengers that are only found in the larger types of ocean liners. They are a splendid example of the kind of workmanship that can be turned out in an American shipyard and it is to be hoped that other steamship owners will give serious consideration to replacing such vessels as have become antique and which foreign ships would drive out of business if it were not for the coastwise laws. Owners may well consider the fact that when the *Alleghany* and *Berkshire* were contracted for the price of steel was only $1.40 a hundred pounds. It is now $2.50 with the prospect that not only steel but other materials and labor will be dearer in the future.

No Recovery for Injuries Unless Vessel Is Unseaworthy

WHERE an oil tank steamship is new and modern in design, with all necessary improvements to enable her to perform the service in which she was employed and there was no failure to supply proper appliances nor to keep them in order, there can be no recovery for maintenance, cure and wages and this has not been changed by the Seamen's Act, March 4, 1915, Sec. 20, declaring seamen having command not fellow servants with those under their authority, says the Court in the *Swiftsure,* 286 Federal Reporter, 689.

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Mammoth Car Ferry Launched on Ohio River

Steamer Will Handle Complete Trains Consisting of Mogul Engine and Eleven Steel Pullmans at a Single Crossing

THE recent launching of the huge railroad car transfer steamer *George H. Walker* in the Ohio River attracted a large crowd of spectators, as the event marked history in marine construction for the inland rivers and waterways. This steamer is the largest and most modern boat that has ever been built and launched for the inland rivers and it will be placed in railroad car transfer service across the Mississippi River between Mexico and the Southwest, and New Orleans and the East. The river crossing is made between Anchorage, La., and Baton Rouge, La. Complete trains consisting of a powerful Mogul engine and 11 85-foot steel Pullman cars; or 25 loaded freight cars will be handled by the boat at a single crossing.

The steamer has a molded length of 340 feet; a beam over the guards of 91 feet 6 inches; a molded beam of 56 feet and a molded depth of 11 feet. It is of all steel construction throughout, carrying three tracks with switches arranged so that the cars can be shifted from any one track to the other two. The parallel midships body is about 244 feet long. The entrance is 48 feet long and of the modified scow-bow type, so as to improve the navigating characteristics and to sweep aside driftwood. The boat has a long sloping stern 48 feet in length.

Hull Construction

The hull is divided into 26 watertight and two oiltight compartments by means of 13 transverse bulkheads and a centerline bulkhead. In addition to the longitudinal bulkhead on the centerline, there is one non-watertight longitudinal wing bulkhead on each side in way of the side tracks. These wing bulkheads are intercostal between the transverse bulkheads. The three fore and aft bulkheads and the sides of the boat, forming five longitudinal girders, provide ample strength and rigidity under all conditions of loading. The scantlings are such as to withstand the weights superimposed and to absorb shocks and impacts resulting from the heavy locomotives passing from the land cradles on to the floating structure.

The shell plating is 7/16 inch throughout; deck plating ⅜ inch and 7/16 inch and all bulkheads are made up of ⅜ inch plating. The transverse bulkheads are closely spaced and with one longitudinal bulkhead in way of each track, the weights of the cars and the stresses resulting therefrom are well distributed over the entire structure. The racking and torsional strains are taken care of by trusses placed athwartship between the transverse bulkheads.

The guards are supported at every fourth frame by substantial outriggers of the truss construction type, and a deep web plate is fitted at every transverse bulkhead. In way of the machinery space, the outriggers are placed on alternate frames. Additional support is provided in the way of the paddle-wheels and boilers by means of stiffeners and hog rods from one side of the boat to the other.

The deck house is a comparatively light structure consisting of ¼ inch plating at the bottom with 3/16 inch plating at the top and 3/16 inch flooring. Stiffeners are placed on alternate frames, with deck beams at every frame.

The three tracks are spanned from starboard to port side deck house by a bridge 27 feet long, supported by two heavy trusses and by double channel columns rising from the hull. The pilot house is built of wood and its dimensions are 16 feet by 18 feet.

The boiler plant is made up of two batteries of boilers, each consisting of two boilers 6 feet in diameter and 18 feet long; one battery on the starboard and one on the port side of the boat. The boilers are of the modified Bonson type and will be adapted to the burning of fuel oil but will also permit of the possible use of coal. Oil burners are of the Lientz type, using steam for atomization.

These boilers are designed for 200 pounds pressure and have a total heating surface of 7,520 square feet. One battery of boilers is of sufficient capacity to furnish steam for both engines, so that the boilers on the other side of the boat can be shut down for repair or cleaning without suspending the operation of the boat. The flues are 3½ inches in size and water pipes connecting the headers are 4 inches, outside diameter.

Induced draft is provided for by steam exhausting into the smoke stacks, but generally the boilers will be operated under natural draft and the steam exhaust will be used for heating the feed water. The steam lines and the feed water lines are interconnected so that the main engine and auxiliaries on one side can draw steam from the boilers on the opposite side and the boilers can be served by the auxiliaries on either side. The boilers are lagged with 2½-inch "Sil-O-Cel" and the flame bed is built of fire brick and "Sil-O-Cel" and covered on the outside with sheet metal.

Propelling Machinery

The steamer is propelled by independently operated side wheels, 31 feet in diameter and 14 feet in length, having 18 buckets 36 inches wide. The wheels will be driven by two engines of the two-cylinder simple non-condensing type. The wheels are carried by three cast steel flanges mounted on the shaft, which tapers to 11 inches in diameter at the outboard end.

The cylinders of the engines are 18 inches in diameter with 36-inch stroke and are inclined at an angle of 15 degrees from the horizontal, forming an open inverted "V." Each engine develops about 600 indicated horsepower at 90 revolutions per minute when supplied with steam of 200 pounds pressure.

The cylinder and valve chest are cast integral of close grained cast iron, forming a rugged and simple engine. Valves are of cast iron of the piston type. The piston rods and connecting rods are of high-grade forged steel machined all over. All the valve rods and piston rods have metallic packing. The connecting rods, which are of the closed-end type, are fitted with semi-steel boxes and babbit lining.

Single Reduction Gears Used

The valve gear is of the Joy type, especially designed for the service, by means of which a wide range of cut-off is obtained whereby the power can be nicely regulated to suit the requirements. The speed of the engine is geared down from 90 to 15 revolutions per minute at the wheel by means of a single set of spur gears. The cylinders and valve chests and all steam pipe are carefully lagged to insure dry steam in the operation of the engines.

All bearings are babbit lined and well lubricated to effect a reduction of frictional loss to a minimum. All parts entering into the construction of the engines have been designed with a view to economy in operation and easy access for maintenance and overhauling.

The auxiliary equipment of the boat is complete in every respect. One 9 by 5 by 10-inch horizontal duplex Worthington feed pump is installed on each side of the boat. There is one 9 by 5¼ by 10-inch horizontal duplex Worthing-

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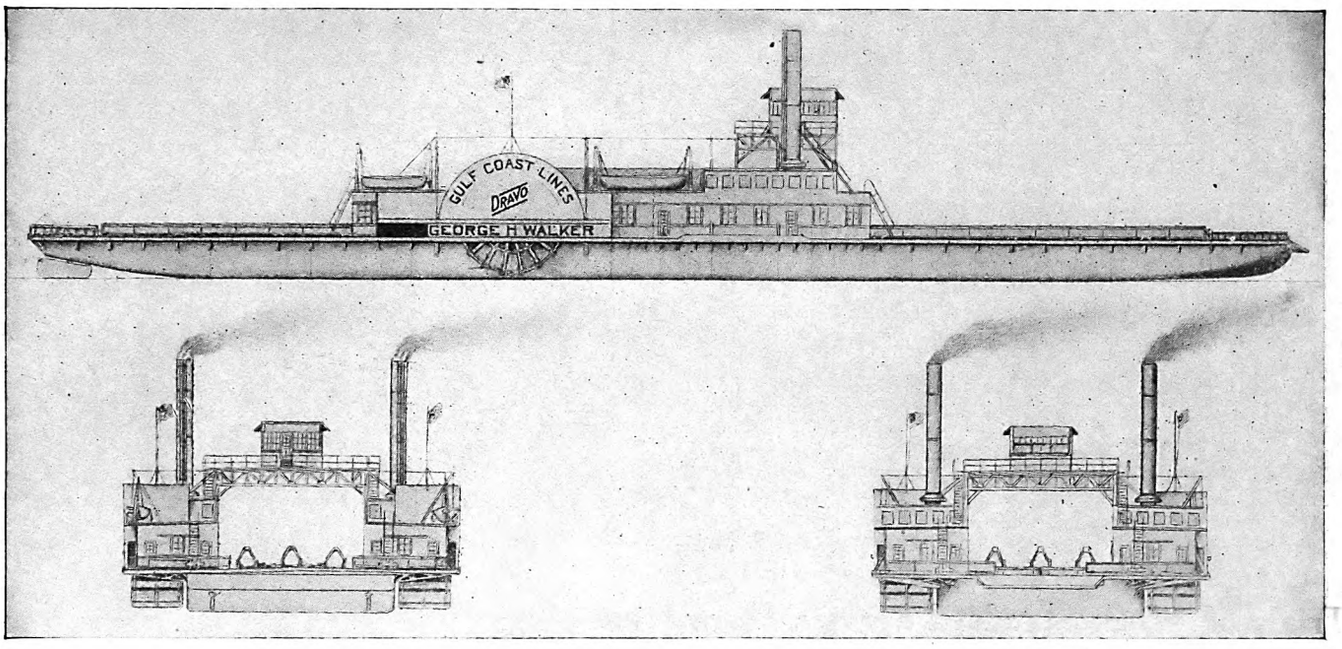
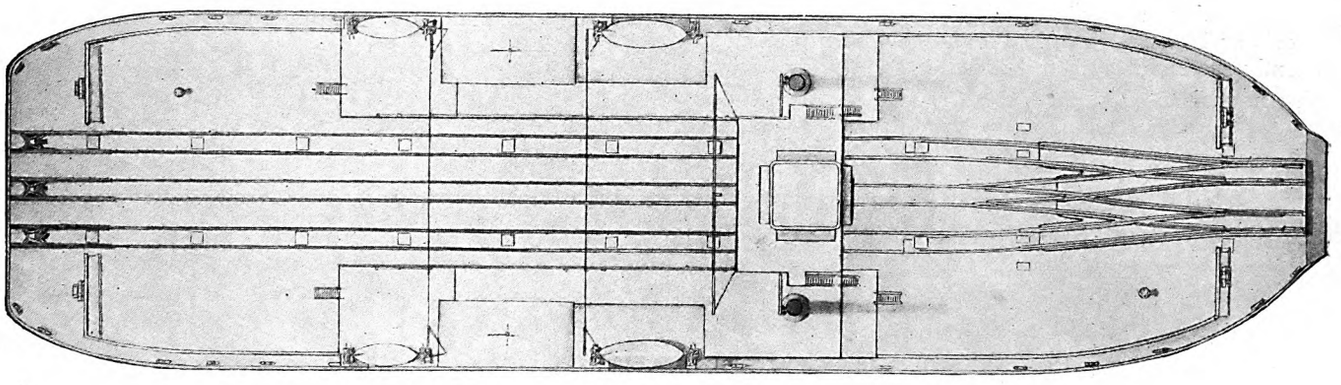


Side and End Elevations of Mississippi River Car Ferry George H. Walker



Deck Plan of Railroad Car Ferry George H. Walker

ton sea suction pump on the port side and one on the starboard side for transferring feed water from the river to the Cochrane open type feed water heaters. These pumps can also be used for fire pumps. There is also installed a 4½ by 2¾ by 4-inch sanitary pump of the horizontal duplex type. Four 4½ by 2¾ by 4-inch horizontal duplex pumps are installed for fuel oil service. On each side of the boat there is a feed water storage tank 5 feet in diameter and 12 feet long. The feed water heaters are mounted on top of the storage tanks.

The steering engine is a two-cylinder simple engine—6 inches in diameter with a 7-inch stroke and is located aft between the two tillers. A screw direct connected to the crankshaft actuates two cross heads, one on each side, which move in athwartship direction, and are connected to the tillers by means of links of "H" beam section. The follow-up gear is connected to the control valve whereby the angle of the rudder, as indicated by the tell-tale, can easily be controlled by the helmsman. The steering engine is operated from the pilot house by means of shafts and gears.

There are two balanced rudders of the composite type entirely covered with steel plates and filled with oak, the rudder stock being 11¾ inches outside diameter. There is installed on the boat a 10-kilowatt De Laval steam turbine generator, which provides current for the lighting of the boat and for the search lights.

Every provision has been made to safeguard the passengers through watertight sub-divisions of the hull and through ample life boat facilities. The fire equipment apparatus and life saving equipment are up to date in every respect and meet the requirements of the United States Steamboat Inspection Service. Mechanical davits of the "Steward" type are fitted for all life boats. The interests of the passengers on the cars have not been overlooked as the boat affords a 750-foot promenade during the period of crossing and an artistic hand rail is provided along the deck promenade.

The design and construction of the complete boat, including the boilers and the engines has been handled by the engineering staff and the shops and boat yards of The Dravo Contracting Company and launching was made at their Ohio River Boat Yard on Neville Island before a large audience including prominent guests representing the marine and river interests of the inland waterways, who were attracted because of the unique interest in this piece of river craft which has focused attention on marine construction in the Pittsburgh district.

The boat has been constructed for the Gulf Coast Lines, New Orleans, Texas & Mexico Railroad, with general offices at Houston, Texas, at a cost of approximately one-quarter of a million dollars. As the largest vessel of its type so far built, its performance will be watched with interest.

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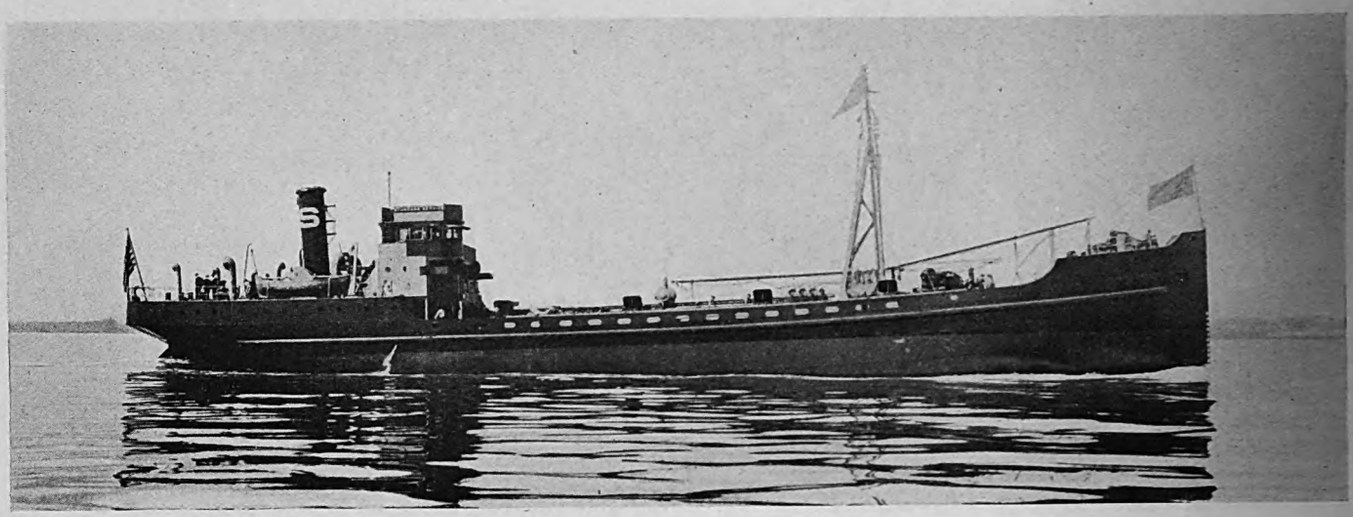


New Standard Oil Motor Tanker Standard Service

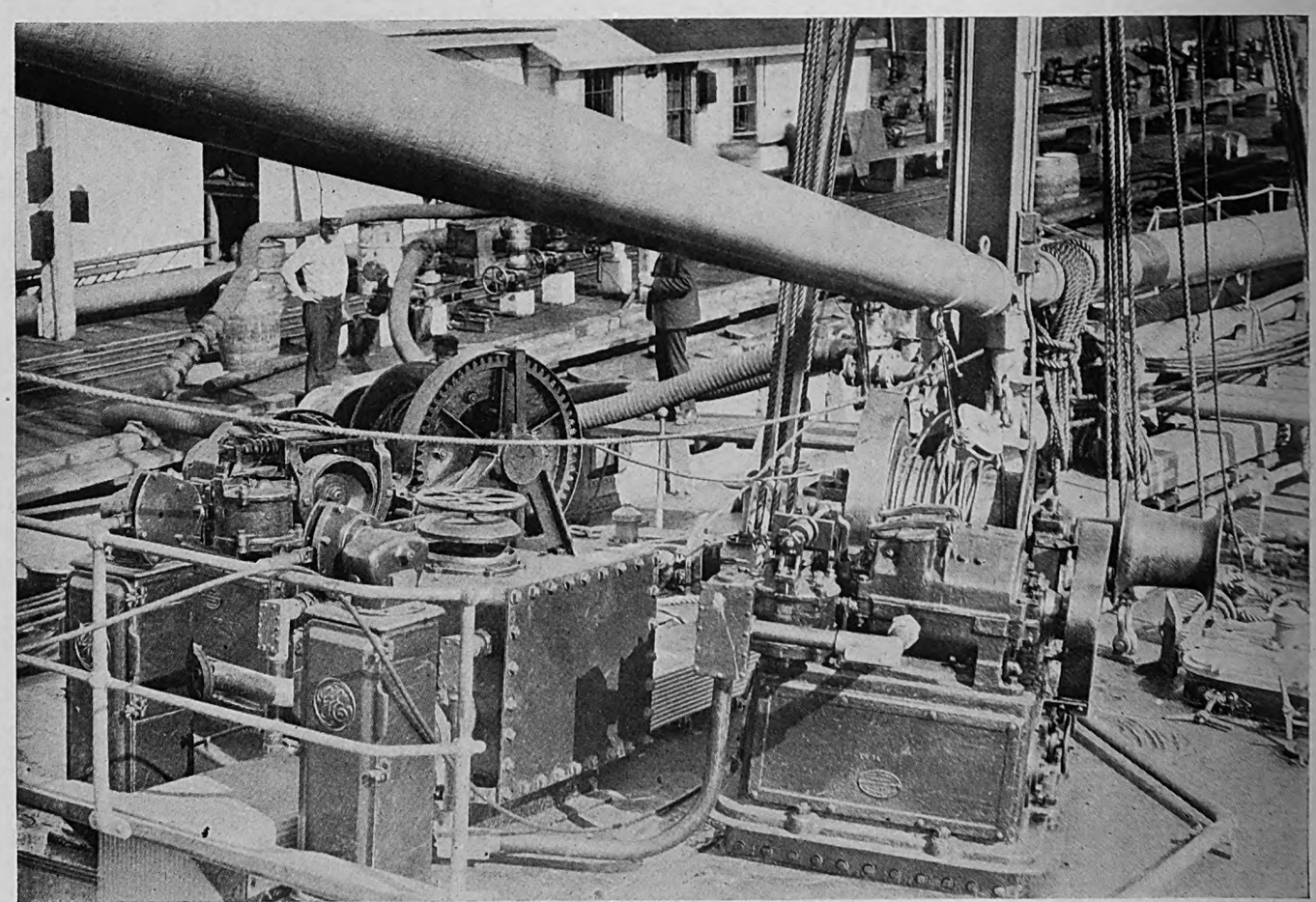
Trials of M. S. Standard Service Show Advantages of Diesel Electric Drive

SEA trials of the Standard Oil Company's first Diesel electric driven tanker *Standard Service* were completed off San Francisco on April 2 and have been pronounced eminently successful by both the builders and the owners.

The normal speed of the propeller is 130 revolutions per minute, but during the builders' trial it was operated at about 145, and the load was less than 1,000 amperes, whereas the full load rating on the motors is 1,065 amperes.

During the owners' trial the craft was well loaded and the full load current was approximately 1,000 amperes with the propeller turning at 145 revolutions per minute.

Readings taken on four different occasions when the control was thrown from full speed ahead to full speed astern showed that at no time did the load go above 1,000 amperes. The change from full speed ahead to reverse took from ten to twelve seconds. During the reversal, all vibra-



Electrically Driven Deck Winches on Standard Oil Tanker Standard Service

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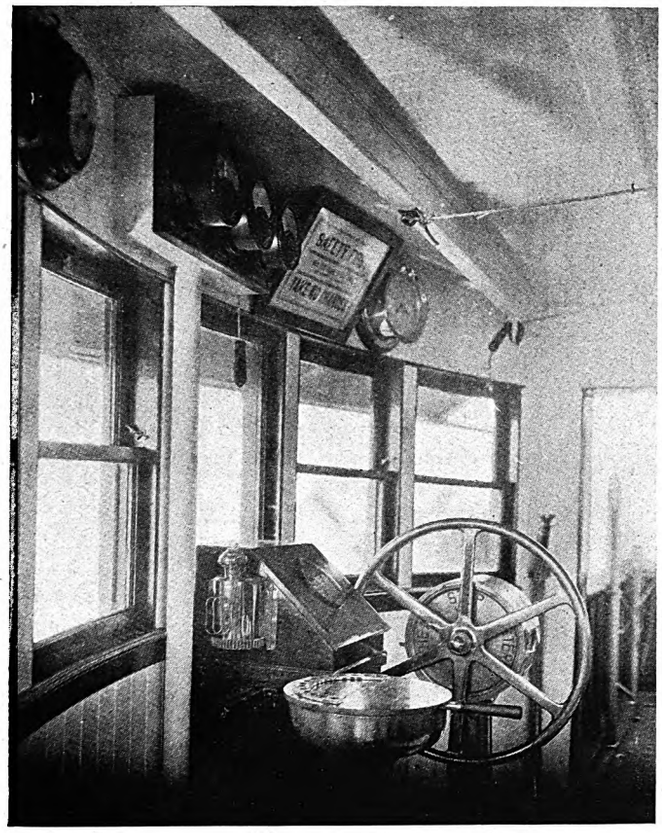


Pilot House Control on M. S. Standard Service

tion was eliminated and unless one were observing the instruments he would have no indication of what was taking place on the propelling equipment. One of the directors of the Standard Oil Company, who was steering the boat with one hand and operating the controller with the other, was asked to throw the controller from full speed ahead to full speed astern and was amazed at both the simplicity and the perfect control.

The principal dimensions of the *Standard Service* are:

Length	210 feet
Beam, molded	40 feet
Depth	16 feet 6 inches
Block coefficient	0.76
Mean load draft	15 feet
Loaded displacement	2,725 tons
Deadweight	1,875 tons
Cargo-tank capacity	12,400 barrels
Cargo-hold capacity	225 tons
Fuel-tank capacity	585 barrels
Propelling motor power	600 brake horsepower
Estimated speed, loaded	9 knots
Fuel consumption, running	(24.5 barrels per 24 hours)
Cruising radius	24 days
Fuel consumption, pumping out	15 gals. per hr.
Pumping-out time	6 hours

The tanker is driven by propelling units consisting of two General Electric 300 horsepower motors mounted on the same base and with a common shaft and driving a single propeller. Current is supplied by two General Electric 245 kilowatt, direct current generators with a 30 kilowatt exciter connected to each, each generator and exciter being direct connected to a 400 brake horsepower six cylinder four cycle Pacific-Werkspoor Diesel engine.

The main control equipment consists of a control panel in the engine room on which are installed the various switches, field rheostats, instruments, contactors and relays; a panel in the pilot house carrying instruments for indicating propeller speed, line amperes and motor field amperes; a controlling rheostat for varying and reversing the shunt field current of the two generators; and a propeller speed magneto connected electrically to the speed indicators on the panels.

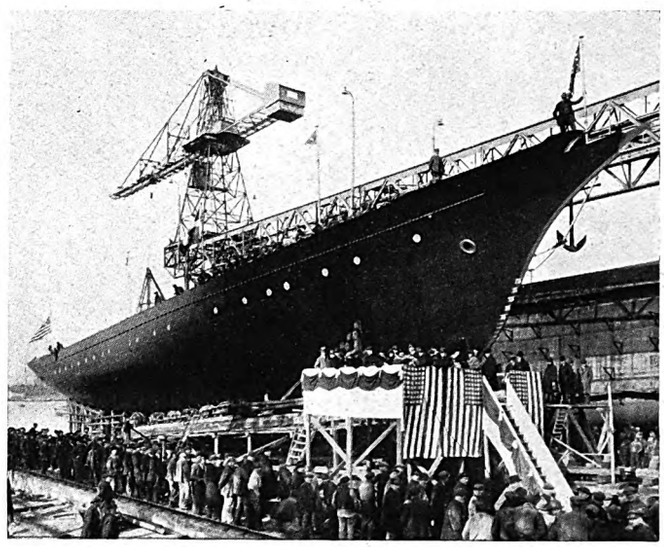
As the same generating sets which supply the motive power of the craft furnish power also for the cargo pump motors for discharging the cargo, no auxiliary plant is needed. The equipment is capable of discharging the entire cargo in about six hours. Sets of lubricating oil, cooling water, bilge and other pumps are driven by each engine. A storage battery and a small auxiliary generating set is furnished for supplying light when the vessel is not in operation.

Auxiliary Diesel Yacht Hussar

MESSRS. BURMEISTER & WAIN, LTD., Copenhagen, recently launched the seagoing steel auxiliary Diesel yacht *Hussar* for Edwin F. Hutton, of the New York Yacht Club, from designs by and under the supervision of Messrs. Cox & Stevens, of New York. The *Hussar* is built to the highest classification of Lloyd's with the following dimensions:

Length on deck	196 feet 7 inches
Length, waterline	164 feet
Breadth, molded	33 feet
Draft, mean	14 feet
Cruising radius	9,000 miles

She is provided with auxiliary propelling machinery of Burmeister & Wain's yacht type, developing 800 indicated horsepower, anticipating a speed without sails of 11.5 to 12 knots. The engine will drive a two-bladed reversible feathering-type bronze propeller, so designed that when the vessel is under sail the blades may be turned in such a way as to offer no interference to sailing, and at the same time completely fill the propeller apertures. The equipment of auxiliary machinery will consist of two 33-kilowatt Diesel-driven dynamos, and the electrical installation includes Edison storage batteries of large capacity, electric boat hoists, equipment for handling sails by power, electric windlass, refrigerating machine of large capacity.



Diesel Yacht Hussar Ready for Launching

The forward and after overhangs are reasonably short and the stem of the clipper type. The rig is that of a three-masted schooner, having a yard on the foremast for long runs with favorable wind. In order not to exceed the limiting factor for operation in and around New York, the

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height of the topmasts permit passing under the Brooklyn Bridge.

In order to meet the owner's intention to make extended voyages at sea, several features were decided upon, including a raised poop deck, allowing dry deck space for the owner and his guests, even in heavy weather. There are provided very comfortable quarters, no expense having been spared in any direction where either seaworthiness, strength, comfort or attractive appearance is concerned.

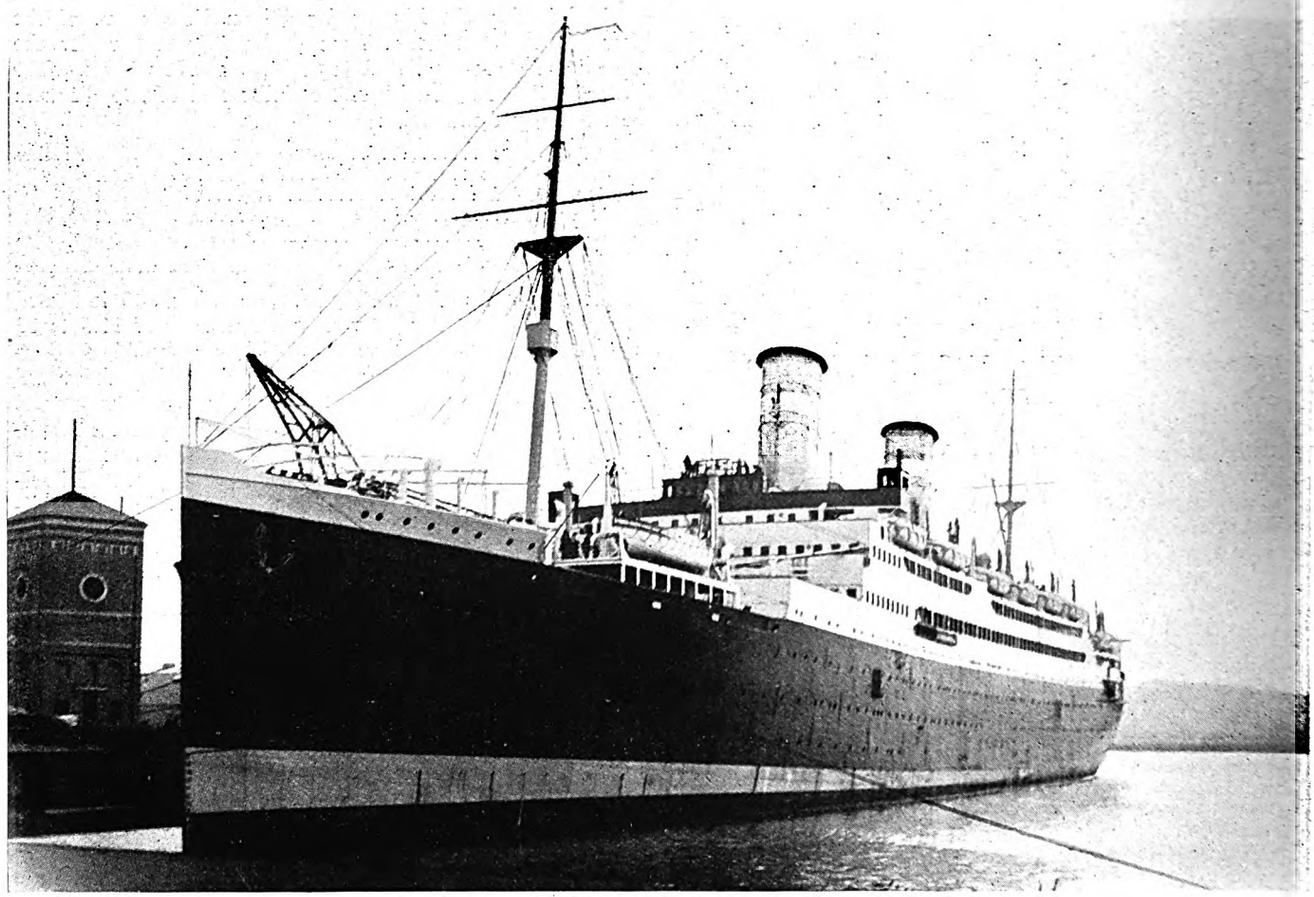
Another Luxurious Liner for the Italian Lloyd Sabaudo Fleet

DURING the first week in April trials were run in the Firth of Cylde of the Italian Lloyd Sabaudo liner *Conte Verde,* which has been built and engined by William Beardmore & Company, Ltd., of Dalmuir. A sister ship, the *Conte Rosso,* also built and engined by William Beardmore & Company, has been giving very satisfactory service on the Mediterranean and North and South Atlantic routes. When completed she was regarded as the most sumptuously furnished and decorated vessel built on the Clyde up to that time. The only difference between the *Conte Rosso* and the *Conte Verde* is that the latter has the super-structure considerably strengthened and embodies a slight re-arrangement of the passenger accommodations by the introduction of a few more special cabins de luxe.

She is 591 feet in length over all, 570 feet between perpendiculars, 74 feet in breadth, 40 feet in depth to shelter deck, 26 feet load draft, of 18,000 gross tons, 20,000 indicated horsepower, and 18½ knots speed. She has accommodations for 230 first class, 290 second class, 1,880 third class passengers, and a crew of 420—making a total of 2,820.

The first class passengers are berthed in specially large cabins for one or two persons, while certain cabins can be made intercommunicating so as to form suites. Besides, there are a number of special suites, each comprising bedroom, dressing room and bathroom. The first class dining rooms are unique, as the space of three decks is utilized for an upper and a lower dining saloon, thus obtaining for each a headroom of 12 feet 6 inches. The first class public rooms, the designs of which were prepared by Italian architects, include the two dining saloons, a music room, a social hall, a library, and a smoking room with cafe. In addition a large deck area is set aside for recreation and promenade purposes.

The second class passengers have large four-berth cabins, a dining saloon, a lounge, and a smoking room, while the third class berthage is of the open type in large compartments, with appropriate dining and recreation spaces.



Italian Lloyd Sabaudo Liner Conte Verde, of 18,500 Gross Tons, Built and Engined by Messrs. William Beardmore & Company, Ltd., Dalmuir, Scotland

The propelling machinery consists of two sets of Parsons compound double-reduction geared turbines supplied with steam by six double-ended and two single-ended boilers, arranged to burn oil fuel but capable of being changed over rapidly to the use of coal.

SHIPBUILDERS' ACTIVITIES.—At the recent annual meeting of the Atlantic Coast Shipbuilders Association, the secretary briefly traced the organization's achievements mentioning among others its unremitting campaign for development of the American merchant marine, for the stabilization of private employment relations, for improvement in our immigration policy, and its constant insistence that the Government shall not compete unfairly with private business.

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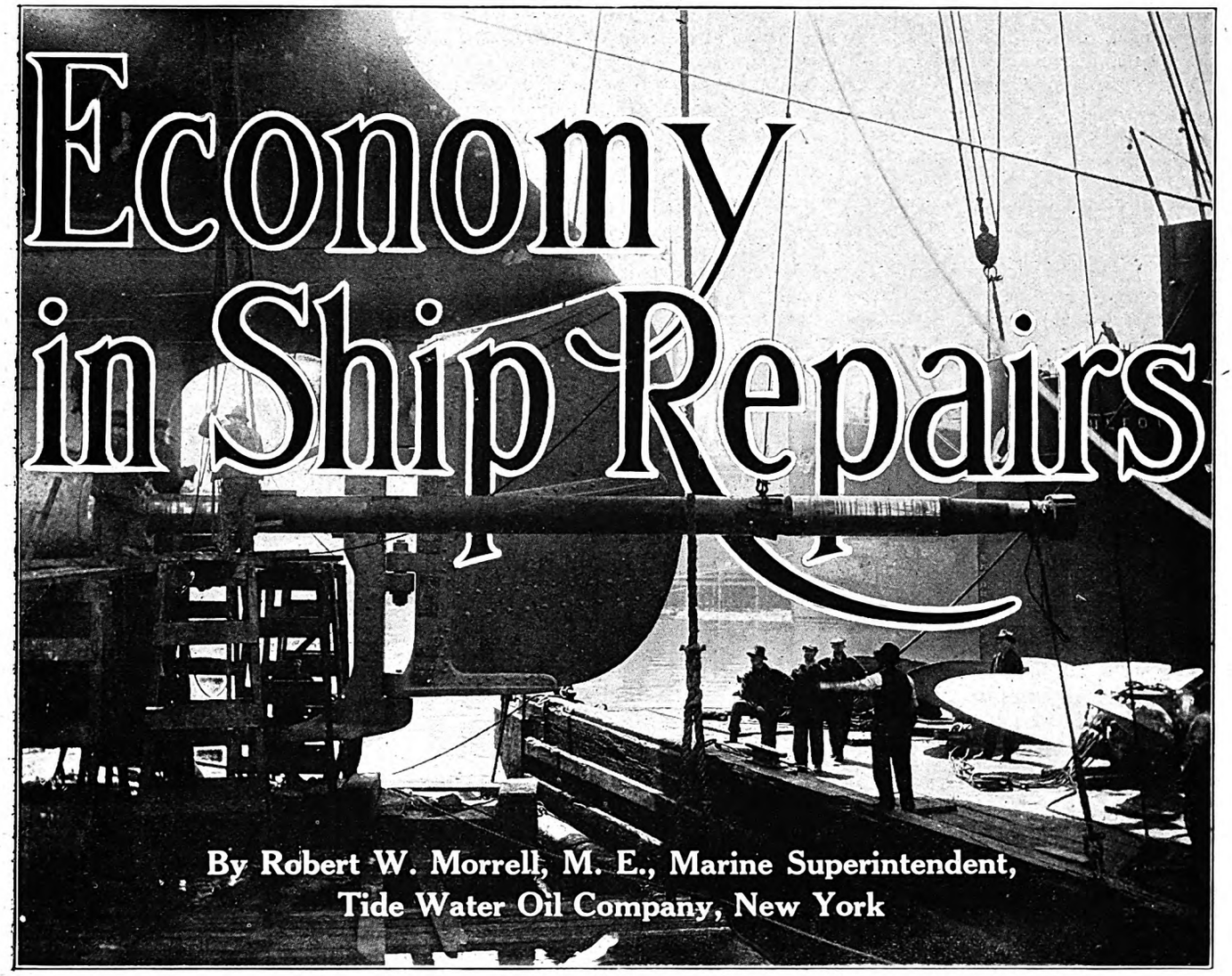

Economy in Ship Repairs

By Robert W. Morrell, M. E., Marine Superintendent,
Tide Water Oil Company, New York

SHIP repairs fall naturally into four principal groups: 1. Repairs required for the economical performance of the vessel, such as cleaning and painting the underbody to maintain the speed without undue expenditure of fuel; boiler cleaning to secure proper boiler efficiency; renewal of packing to prevent wastage of steam.

2. Repairs required for safe operation, such as hydrostatic boiler tests, periodical classification surveys, compass adjusting, etc.

3. Repairs due to ordinary wear and tear; the maintenance of the vessel in good condition, to prevent undue depreciation or deterioriation. For example, scaling and painting the steel hull, keying up of machinery, renewal of zinc plates, and the like.

4. Break-down or damage repairs; the repairing or renewal of parts due to breakage through carelessness or accident, collision, grounding, heavy weather or fire damage repairs.

Obviously, many repair jobs may be classed under more than one of these headings, but the above grouping forms a convenient basis for analysis in any constructive effort to reduce repair costs.

By reduction in repair cost is not meant keeping the repair bills low at the expense of other operating costs. Superintendents have been known to incur extravagant repair bills but by charging them off to capital account, depreciation, stores, insurance or other accounts, claim a wonderful showing on low repair costs. This is of course false economy, and it is necessary to recognize the broad principle that repairs are incurred for the good of the ship as a whole, and that, while it is important to minimize the repair account, any repairs are justified which will reduce the general operating expense. Repairs are repairs, no matter what else they may be called or how charged on the books, and we must avoid any mistaken sense of security in believing we have attained efficiency through low repair bills, so long as the money is going out under another name, without ample justification. It is therefore necessary to consider the repair question from all angles in order to exercise the most thorough supervision.

This article considers the subject of steamship repairs from a broad viewpoint in its relation to the general scheme of steamship operation. Repairs constitute an important factor in the operating costs and have an effect upon the other items in the voyage accounts which must be thoroughly analyzed and taken into consideration, if we are to achieve the maximum efficiency in operation.

The question of just what constitutes repair charges is often difficult to define. The renewal of boilers, pumps, hull plates, or machinery parts, if they increase the value of the vessel, is en-

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titled to be charged, in part, to the capital or investment account. The use of paint is directly attributable to the maintenance and upkeep of the vessel, which is one phase of repairs, yet paint is frequently (and quite properly) charged to ship's stores. Renewal of spare parts, and machinery and oil burner parts in general, which are replaced regularly due to wearing out, are frequently bought from the manufacturer and charged to stores; but if the same parts were furnished by a shipyard in the course of a repair job, they would be charged to repairs. It is rather immaterial just how these items are handled, so long as they are all taken into full consideration and not lost sight of in attempting to economize on repairs.

The Interstate Commerce Commission has made rulings governing the method of charging repairs on vessels under its jurisdiction. This is for the purpose of fixing rates for common carriers, however, and does not always apply to the conditions encountered in overseas trade.

It is quite customary to set up a repair reserve account in an attempt to estimate and distribute the repair expense uniformly over the life of the ship. This is good judgment, as it provides a sinking fund to meet the heavier expenses of renewals of worn-out parts when the ship gets old. Such a reserve may be estimated roughly at 15 to 18 cents per deadweight ton per month for freighters, but is of course a matter for individual opinion. This reserve is usually adopted in estimating operating costs for proposed voyages. It is important, however, to avoid a false sense of security if the actual repairs amount to considerably less than the reserve provides for in a given period; they ought to, especially in the early years of a ship's life. It is the actual repairs which eat up the profits, and one cannot afford to sit back with a sense of satisfaction just because the actual repairs make a fine showing in comparison with the repair reserve. We must be eternally on the alert in handling the actual repairs.

Repair expense and depreciation have a relation to each other which should not be lost sight of. A vessel which has been kept in good condition can be sold after a period of years for more money than a vessel on which little or nothing was spent for upkeep. Therefore, a greater expense for maintenance will reduce the actual depreciation, and a clear conception of these relative values will go a long way toward intelligent control of the repairs. As a general principle, however, it may be said that excessive expense toward keeping a vessel in top notch condition will seldom be recovered in the selling price; therefore the expenditure for maintenance should be limited to the amount necessary to keep the ship in efficient operating condition and to avoid premature renewals or replacements.

One of the chief items to keep in mind in fixing a policy for supervision of repairs, is the importance of the time element. Unfortunately, this is often lost sight of, especially on freighters spending two or three weeks in port discharging and loading cargo. On such vessels, the idea too often prevails that a day or two more or less doesn't matter, where as an actual fact a day's expense is just as great on such a vessel as on one in port only a day or two. Every day spent in port is non-productive, but the overhead is going on just the same: depreciation, insurance, wages, provisions, stores, repairs, port fuel.

The marine executives of the United States are now entrusted with the greatest fleet of merchant ships in the history of the nation. The question of ship subsidy is for the present a closed book, and we can only turn to our task and face the future with the determination that, left to our own resources, we will spare no thought or effort, and leave no stone unturned, in making the most of our maritime inheritance and make the American merchant marine an example of intelligent and efficient operation.

The value of time of course depends somewhat on the valuation of the vessel, as the principal items of the overhead are the depreciation and insurance. The war priced ship, at $200 per deadweight ton, has a tremendous handicap in this respect compared with the ships bought recently at $35 per ton. Nevertheless, this overhead, whether big or little, goes on every day, and each day spent needlessly in port is a definite loss to the owner, whether the turn-around is 2 weeks or 2 days. On a freight steamer, where repairs can be carried out while cargo is being handled, there should be no excuse for the vessel being detained in port for repairs other than dry-docking or possibly repairs to cargo handling gear. Should such items arise, every effort should be concentrated upon such repairs with a view to quick completion.

The daily out-of-pocket expenses for overhead, etc., should be kept constantly in mind, as this is the only determining factor in deciding to what extent overtime on repairs is justified. It also determines many other points, such as whether it is cheaper to send a vessel to a shipyard for repairs or send the repair men to the ship at the berth; also, whether it is cheaper to furnish steam from shore or tug for discharging in order to effect boiler repairs simultaneously, or cheaper to repair the boilers after discharging. The time element is the deciding factor in every case, and too great stress cannot be laid upon the necessity of attaching full importance to the value of vessels' time, in handling their repairs.

This emphasizes the previous statement that repairs must be handled for the good of the ship as a whole, as much as for showing cheap repair bills. It is often necessary to incur heavy repair expense to obtain prompt dispatch, but overtime, extra shifting, shore steam, and other expensive items, are well justified, if they really show sufficient saving of the ship's time. These expenses are sometimes good economy. This will be mentioned again in connection with repairs on ships operating on quick turn-around.

Work done on upkeep and repairs is invariably cheaper, if done by the ship's crew than by shore labor, and the signing on of extra sailors, oilers or wipers is therefore often good economy. A good carpenter or a good machinist on board will do a great deal towards keeping repair bills down. Workshop machinery, shop tools, and any repair materials within reason, are an excellent investment on shipboard.

SPARE PARTS TO BE CARRIED

The list of spare parts to be carried on board deserves careful thought, in order to have the right parts at the right time, without carrying a needless amount of "junk." It is far better to have too many spares than too few, however. The principles to keep in mind in selecting spares are:

(1) What might be needed in case of breakdown at sea?
(2) What would be most useful to provide against breakdown at an out port?
(3) What parts could not be obtained quickly in the home port without great expense?

A judicious selection of spares will often save many thousands of dollars on a single item. The question of spare parts is a complete subject in itself, and one which vitally affects the repair situation.

Some repairs, of course, cannot be done by the ship's per-

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sonnel, and the mates and engineers should be instructed to have clear, complete lists made out upon the arrival in port, showing the work required to be done by a repair yard. The lists must be complete as possible, as it is uneconomical to discover forgotten items just before sailing or even in the middle of a repair job, when too late to obtain bids. A considerable saving in time and money can be affected if these lists are presented by the ship so worded and in such detail that they can be used as specifications in obtaining bids, without having to be re-written and revised.

REPAIRS DUE TO CARELESS HANDLING AT SEA

One of the best ways in which to cut down repair expense is to eliminate the mis-handling of machinery and equipment, and this is a very definite point in which the ship's officers can prove their worth. A great many repair jobs are purely the result of careless handling at sea, and this is an item of repair cost which can be eliminated at its source. I have in mind the burning out of breechings and uptakes through improper burner and draft regulations, furnace crowns coming down through careless filtering, condensers retubed through lack of zincs, cylinder liners scored and piston and rod packing ruined through a high water-level.

Another source of economy in repairs is to do away with unnecessary alterations which cater to individual fads. A company should have a certain well-defined standard system of connections for auxiliaries, lay-out of pipe connections, etc., and should adhere to some uniform scheme based on good practise, rather than sanction an infinite variety of pipe connections, and constant alteration of same, to suit the changing ideas of the men in charge. Before making an alteration, it is always advisable to consider how long the ship was running the way she was, and how much of a detriment the item under consideration was to her efficiency. One must exercise judgment, and combine conservatism with progressive initiative, but above all, one must think, not only twice but three or four times, before spending money on repairs.

Time is an ever-present and all important factor in ship economics. Every day a ship lies idle, through lack of forethought or initative or energy on the part of the operator or Master, is a dead loss, an expense without an earning, a black mark against any record of achievement. Indifference to the value of time of our ships in port is one of our worst faults. Time is money, and equally slippery. Too many delays, if analyzed, could have been avoided by exercising a little snappy supervision. Repairs are a fruitful source of delays, frequently unnecessary delays, and offer a wonderful opportunity for economizing time. Don't blame your delays on the repairs. Handle your repairs so there are no delays.

SHORE STAFFS SHOULD KNOW THEIR SHIPS

It is up to the shore staff to know their ships. The home office should have not only detailed specifications and blue prints of all their vessels, but particulars of all auxiliaries and equipment, giving make, sizes, serial number, etc. There should also be accurate records of dates of last dry docking, United States Inspection, classification surveys, boiler washing, tube sponging, hull scaling, etc., as well as a record of the repairs done to each part of the ship at various times. It is only by having complete and accurate information kept up to date and quickly available that a superintendent can exercise proper supervision over the repair situation. A vessel may be detained a day or two in an outport and, by referring to such data, it might be arranged to take advantage of that time to do some much needed scaling on the boot-top or, to carry out some other work that at another time would interfere with the vessel's schedule.

It is also necessary to know at all times just how much repairs are costing on each ship, not only as a whole but for various sub-divisions such as:

Boiler repairs,	Dry docking,
Main engine repairs,	Hull scaling.

This list can be continued indefinitely, and it is useful, if one sub-heading appears high, to sub-divide it still farther. For instance, if boiler repairs seem too expensive, divide it into:

External cleaning,	Calking,
Internal cleaning,	Renewing or repairing tubes,
Mountings,	Renewing or repairing stays.

In this way the item where the financial leak occurs can be traced down and the condition remedied. In keeping such cost records, however, do not rely on your cost department for periodical figures but keep your own record, based on bills approved.

It is decidedly worth while for the shore staff to do their own estimating and to become trained in that line, and this is something to which sufficient attention is not given today. It is quite essential to know what each repair item will cost before authorizing it. Many times, if we realized in advance how much a repair job was going to cost, we wouldn't consider the expenditure justified, and we wouldn't do the job at all, or we would figure out some other and cheaper way of doing it.

An estimate of his own frequently enables a superintendent to handle a job on an agreed price without waiting to call for competitive bids. If a job is done on a time and material basis, such a preliminary estimate gives a good idea as to whether the bill is reasonable. On the other hand, if bids are called, the preliminary estimate may show the bids are all high and it would be cheaper to do the job on time and material.

This brings up the question of taking bids and placing a contract, or working on a time and material basis. There are arguments on both sides, and many features to be taken into consideration, so that the best policy usually depends upon the circumstances at the time. Naturally, on a rush job, with no time to spare, time and material is the best basis; but with time available in which to prepare complete specifications, there can be no doubt that the best results, on the majority of repair jobs, can be obtained by competitive bids and a contract. This implies, however, a first class specification and a thorough inspection. On time and material, the specification is not so important, but inspection is equally necessary and in addition a checking or time-keeping system becomes necessary, and is an added expense. Time and material is in fact the old "cost plus" system, with no end of opportunity to slip in extra charges for foremen, shop tools, lights, excess material, and other items very difficult to check. If time and material basis is used, it is best done by billing actual labor and material plus an agreed fee.

SPECIFICATION SHOULD BE COMPLETE AND ACCURATE

A loose specification is worse than none at all on a contract job, and every effort should be made to have the specification on which bids are called as complete, accurate and specific as possible. If indefinite, the bidders can only pro-

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tect themselves by including an amount to cover contingencies left open by the vague wording, so that the bids are higher than the job is worth. All such phrases as "repaired or renewed," or "as may be directed," or "to suit conditions," or "to owners' approval," or "as may be found necessary," should be eliminated unless the meaning is perfectly obvious when looking at the job.

An incomplete specification is the most expensive thing to contend with. Items left out or forgotten have to be done after the contract is awarded, at the contractor's price.

In many cases it is impossible to tell in advance whether certain work will be required, until the job is opened up. In such cases, separate prices should be taken, which can be authorized or not later on as the conditions indicate. Do not include an uncertain item in a specification for fear it will be forgotten. If in doubt whether it will be needed, get a separate price on it. These separate prices may or may not be taken into consideration in awarding the contract, depending on the likelihood of having to carry out such separate items, but at least the separate prices give a good protection, if the work materializes.

Inspection should be well organized. The shore staff should make thorough inspections of the ships while in port, to keep in close touch with their physical condition. The inspection of repairs in hand by a shipyard should be divided between the ship's personnel and the shore staff, with all possible co-operation. On engine room work, the chief engineer should inspect and approve, before closing up, all work on machinery for which he is responsible. The port engineer should likewise maintain a supervisory inspection in order to insure uniform general practise on all vessels of the fleet.

We need closer co-operation between deck and engine departments on shipboard, and between the ship's personnel and the shore staff, in order to get results. All hands are working toward the same end, with a common interest, and those who cater to petty jealousies and mutual obstruction are only standing in their own light and casting a shadow upon the whole profession as well. The home office is usually in a position to get a broader view of a problem or policy than any individual master or engineer, but the sea-going men are better acquainted with their vessels than anyone ashore could hope to be, and their opinions and suggestions should be given every consideration.

Save Money by Planning Ahead

Work can be planned ahead to advantage, laying out a dry docking schedule clear of the winter months. Painting in dry dock in freezing weather is usually a total loss. This schedule should also coincide as far as possible with United States inspection and classification survey periods in order to cover everything possible in a single lay-up. It is also worth while to plan in advance to bring about the dry docking, United States inspection and survey in the home port. All repairs can usually be done to much better advantage in the home port, under direct supervision. Repairs in foreign ports are subject to heavy duty.

It is often advisable to let minor repairs accumulate until a dry docking period, as it is cheaper to carry out a group of items in one contract than to do each small item at a time, provided there is no operating loss involved.

The handling of repairs on vessels maintaining a quick turn-around schedule, such as tankers, bulk freighters which load and discharge rapidly, and certain passenger liners, represents the highest form of management that demands a well balanced combination of judgment and "pep," and brings out many valuable lessons. The time element becomes magnified, and attention is centered upon maintaining a schedule with only a day or two in port at each end and with a minimum lay-up period for overhauling.

Quick Turn-Arounds Call for Efficient Management

It becomes necessary to exercise judgment in determining where to draw the line between driving a ship in continuous operation, and losing time to keep her up. The ability and willingness of the ship's officers to perform their own upkeep and repairs becomes a vital factor. Overtime and other expensive measures become a source of economy in saving time. A well defined policy is essential, and advance planning becomes necessary.

In order to achieve any sort of operating efficiency it is first necessary to impress upon the masters and deck and engineer officers the fact that it is only through their whole-hearted efforts that our vessels can be kept in operation at all; that unless the vessels are handled with best possible dispatch and minimum expense, they cannot make ends meet and will have to be scrapped. Our officers must understand the value of the time element and must make every effort, first, to keep their ships in first class condition without the assistance of shore labor, and, second, to carry out themselves the bulk of the ordinary repairs, such as keying up, boiler washing, etc. By taking keen interest in details of their ships, the officers can effect valuable savings.

Boiler washing looms up as a determining factor in the planning, and must be handled, if possible, by washing one boiler each time in port. Dry docking, annual inspection and periodical surveys must be combined, if possible. On rush jobs there is seldom time to get bids, and frequently a working agreement with a convenient repair yard is the best policy on rush work.

Arrangements should be made, however, for a vessel to radio ahead her repair requirements, and the shore staff should know the vessels well enough to draw up a specification in sufficient detail to obtain bids while the vessel is still at sea, so the contract can be awarded and the repairers meet the vessel upon arrival. It is also common to run repairs a voyage ahead; namely, when a ship is in port this time, determine the repairs needed next time and get the bids in, so the job is in hand the minute the ship arrives back. Repairs are often postponed from one voyage to the next, when feasible, to avoid a Sunday or holiday job, and there is great advantage in allowing minor items to accumulate until dry docking. The whole scheme of repairs in quick turn-around brings out the fine points of efficient management.

Hydrostatic Boiler Test Excessive

One important factor bearing upon repair economy is the annual hydrostatic boiler test. There is great diversity of opinion as to the advisability of the high test pressure required by law. Most authorities are agreed it is excessive, but hardly any two agree on the remedy. The fact remains, the test pressure is often responsible for boiler leaks and extensive repairs which would not have occurred otherwise. The writer's opinion is that the test pressure should be reduced and a classification certificate accepted in lieu of boiler test. Until some change comes about, however, the only logical course is to exercise every possible precaution in handling the "squeeze" to avoid damage; namely, (1) very uniform building up of pressure, (2) proper adjustment of gages and safety valve springs in advance to avoid repeated application of pressure, (3) holding the pressure only an in-

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stant, (4) gradual release of pressure, (5) temperature precautions.

DAMAGE REPAIRS

With reference to damage repairs, i.e. collision, grounding, heavy weather and fire damage, this usually constitutes an insurance claim. There exists an impression that it is economical to hang as many repair charges as possible on the underwriters; but as this is reflected in future premiums, the advantage is likely to be only temporary, if carried to excess, aside from the moral aspect, which is not within the scope of this article. A damage job usually involves many complications of a highly technical nature, and as the hull insurance entitles the vessel to the services of a surveyor at underwriters' expense, it is frequently wise to take advice from a surveyor specializing in this line. The possible variation of difficulties in these cases is too great to cover here, but a general idea of the terms of the policy and a clear conception of the following features should be had by any one handling steamship repairs:

1. What constitutes a franchise under the policy.
2. Temporary repairs—when and how justified, and when chargeable to underwriters.
3. Disposition of charges for towage, steaming and cleaning tanks, removal and replacement of bunkers, etc. Allowance for diversion to port of refuge.
4. Element of time as applied to collision cases as distinct from other cases.
5. Relation between classification and underwriters' requirements.
6. Protest and certificate of sea-worthiness.

The American Underwriters can contribute their share toward the economical repairs and operation of the American merchant marine to which they owe their existence, by maintaining the highest caliber of men in their executive and technical staffs. It is only by highly intelligent handling of damage repairs and claims that efficiency in this direction can be maintained.

What can the repair yards do toward repair economy? It is to their interest as much as that of any one that our ships be kept in operation, and they must be alive to the fact that they can contribute to that economy of operation without which there can be no existence for the ships or for them. It all boils down to a matter of mutual cooperation. Live and let live. Live and help to live. Play the game on the level. High class efficiency and service will win out.

Efficient Repair Methods Adopted by Shipping Board

By Captain R. D. Gatewood*

Work your crews up to take pride in their vessels; watch the method under which the repair work is awarded; know what the repairs should cost; be sure you have the proper port staff—and then your repairs should cost the minimum.

A SELF-EVIDENT fact is that the successful ship operator is one who, beside filling his vessels, keeps the cost of his vessel operation at the lowest figure. No matter how efficiently or industriously his traffic men work to fill the bottoms, if the result of their efforts is to be turned into a deficit by the losses of physical operation of the vessels, then there is no hope for a paying proposition.

This article will deal only with vessel repair costs, and to illustrate to you the enormity of this item there is below listed the approximate percentage of the cost of physical operation of the Shipping Board fleet:

Operating Divisions.	Percent.
Repairs (including insurance repairs)	13
Fuel	25
Subsistence	7
Wages and overtime	24
Supplies and miscellaneous	8
Port charges	9
Cargo charges	14

In the general item of repairs are included the following classes, with the percentage of the total set opposite each:

Classes of Repairs.	Percent.
Maintenance (voyage repairs)	50
Betterments and alterations	11
Reconditioning	10
Insurance repairs	18
Operation of vessels expense (which includes items such as installing grain fittings, cattle fittings, repairs to navigating instruments, rigging, tackle, etc.)	11
Total	100

The "maintenance" item is wholly chargeable to repairs, as is also the greater part of "operation of vessels expense." "Betterments and alterations" and "reconditioning" of course are capital charges, while "insurance repairs" in the privately owned fleets are not usually paid by the owner but by the underwriter.

The expenditures of the Shipping Board for the general item of "repairs" since 1919 are listed on page 348.

A basis of cost per deadweight ton per month per mile would of course be a fairer basis of comparison, but the large number of vessels operating does not permit obtaining such a figure without undue labor.

An analysis of these figures will indicate a gradual decline in the cost per deadweight ton. This is not an altogether natural decline. The cost in 1920 was staggering and the problem was thoroughly studied from all angles. It was realized that there could be no sedative adopted that would solve the problem in a few months. Whatever was to be done should be so planned that the correction of past practices would be gradual and those concerned would be educated in these policies one after the other when they were ready for them.

There were many self-evident causes of this large expenditure, chief among which were the performance of many alterations which were purely the individual ideas of the ships' crews; the failure of crews to perform repairs that properly should be handled by them; indifference of crew in operation of vessel; inexperience of vessels' personnel; inadequate and inefficient port staffs; high cost of labor and materials; shortage of skilled ship workers; irresponsible repair firms and inefficiency of repair yard organizations; the cost-plus (or so-called "time and material") method of effecting repairs; and many other lesser causes.

Some of these difficulties would of course be straightened out by time alone. We could not govern the cost of labor and material. The curtailing of work and increase of production would solve that problem; irresponsible and inefficient

*Director of maintenance and repair, United States Shipping Board, New York.

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repair firms would flourish by their own hand when the abnormal demand for [illegible] work would cease; the workers would become more skilled with time and would take keener interest in their jobs as there ceased to be a demand elsewhere for their services.

MONTHLY STATEMENT OF SHIPPING BOARD EXPENDITURES FOR REPAIRS

Month	Expenditures	Tonnage in Service	Cost per DWT.
1920—January	$4,787,082.30	8,008,178	$0.59
February	5,417,507.00	8,426,784	.64
March	6,992,890.26	8,434,958	.83
April	6,571,170.50	8,715,063	.75
May	6,725,899.38	8,776,609	.77
June	5,625,657.78	8,960,995	.63
July	4,508,669.07	9,141,730	.49
August	4,055,757.31	9,028,202	.45
September	5,340,015.50	8,605,546	.62
October	4,397,424.22	8,416,635	.52
November	4,394,474.21	8,401,746	.52
December	3,335,604.04	8,305,405	.40
1921—January	3,415,134.39	8,363,854	.41
February	3,963,295.51	7,739,277	.51
March	4,261,773.93	7,516,620	.57
April	3,198,957.57	7,072,368	.45
May	3,507,093.43	5,974,278	.60
June	2,326,561.94	5,280,058	.44
July	2,686,730.99	5,217,438	.51
August	2,539,950.17	5,262,902	.48
September	2,141,663.27	5,309,160	.40
October	1,801,426.01	5,120,035	.35
November	1,371,870.71	3,815,359	.36
December	1,166,341.42	3,795,941	.31
1922—January	989,137.29	3,376,207	.29
February	1,115,023.66	3,232,235	.34*
March	1,418,626.31	3,306,715	.43*
April	1,398,048.53	3,506,813	.39*
May	2,024,021.01	3,628,186	.55**
June	1,767,272.76	3,704,552	.48*
July	1,037,709.59	3,413,071	.30
August	1,294,669.06	3,291,593	.39
September	919,521.93	3,269,304	.28
October	1,091,160.51	3,305,760	.33
November	1,075,946.85	3,325,009	.32
December	1,307,200.67	3,362,059	.39
1923—January	2,057,157.35	3,517,155	.58
February	1,516,578.36	3,533,604	.43

*The comparatively large expenditures during these months were caused by preparing vessels from lay-up for active service.

**The large expenditure this month was due to payment of one bill for damage repairs of over $500,000 which had been held in abeyance for a number of months.

But many deficiencies were within our power to correct and our attack was planned along the following lines:

A—Extend policy of competitive bidding to the practical elimination of all other forms of awarding work.
B—Eliminate all alterations except the absolutely necessary ones.
C—Carefully examine repair lists to eliminate all work found unnecessary or which could be performed by crew.
D—Develop estimating, so that we would know the value of the work to be performed.
E—Educate the crews to perform all work possible and take an interest in the property under their care.
F—Insist on the maintenance by operators of efficient qualified port staffs.

Competition is the basis of a successful and healthy industry, so that the extension of this policy was not alone beneficial to the repair costs, but to the ship repair yards and allied industries as well. It has resulted in the elimination of the irresponsible, inefficient organizations who entered this business during the flood tide of war conditions. The ship repair industry is now stabilized, the market is highly competitive and the yards are approaching rapidly their pre-war efficiency.

The very marked decline in repair costs is due to this one thing more than to any other and now from eighty-five to ninety percent of Shipping Board repair work is placed after competition.

Two or three years ago, and to a lesser extent now, the idea was prevalent among the sea-going personnel that the vessels built during the war were exceedingly deficient. This led to an enormous number of requests for alterations and betterments which were mainly inspired in the above belief. Many of them were desirable but were they necessary? Many a man desires a particular make of automobile, but if he cannot afford it, buys a cheaper one. And you can be sure that he makes that one operate to his satisfaction, because it is his property. So, the bars were placed against alterations, except where we were convinced that they were absolutely necessary for the proper operation of the vessel, and the protection of life.

The idea seemed to be prevalent among many of the crews that the sole object of placing them on the vessels was to keep the vessels moving from port to port. They took little or no interest in it, feeling that any repairs developing could well be taken care of by shore gangs. Anyway, it was Government property and they did not care if it depreciated, although they were joint owners with you and me. But this was not the proper spirit to display.

Could a successful merchant marine be developed with such a feeling? No, and that is why we insisted on vessels' crews performing all work properly belonging to them. This has been so inculcated in the crews that we now have relatively few requests for work to be performed by shore forces that could properly be done by the crew. Of course, the increasing experience of our crews has helped, but the average crew now have a greater interest in their vessel and feel to a greater extent that it is their home. Until the spirit of pride in their ship is developed to its maximum among our sea-going people, our merchant marine cannot achieve outstanding success, but great progress along this line is evident to us through the barometer of repairs.

Why do you go to an assayer to have him determine the value of your precious metals? Because you have confidence in his judgment and determination of these values. Accordingly, why should we place repair work in hand without knowing beforehand the value of that work? We have therefore employed and developed in our organization men qualified as estimators, who have full knowledge of the ship repair market and who know what a job is worth. We have in this way rejected bids that were excessive as compared with our estimate and have later obtained more reasonable prices.

A number of vessels under one company without proper technical direction cannot operate to the maximum of their efficiency. Accordingly, we have insisted that the operators have on their port staffs men whose efficiency and knowledge of their business are unquestioned and men who are of the proper port staff type—men in whose good judgment and knowledge of the business the crews cannot help but impose confidence. To my mind the keystone of successful operation rests on the selection of the proper port staff, for with the proper port staff the selection of the proper crews is assured and the maintenance of efficient operation by them is inevitable.

I cannot too urgently recommend American ship operators to pay close attention to the repair of their vessel. As I have said before, this item is one which may cause a large loss in your operating revenue and may determine the side of the ledger on which the balance will show.

The Shipping Board has greatly decreased its repair costs. The methods employed were dictated only by common sense and knowledge of the repair business. They were not revolutionary in any sense. We simply watched our property, sought the leaks, and repaired them. You must grant that with such a large operating fleet as that of the Shipping Board, such efforts were vastly more difficult than would be those of the average private shipowner.

Let your motto be, "Watch the Repairs."

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Does It Pay to Have a Satisfied Crew?

By Captain John F. Milliken*

Sooner or later our shipping men will discover that the cheapest men are not always the most economical and that a satisfied crew pays real dividends. The best way to arouse a real interest among the officers and crew is to encourage the men to purchase a few shares of stock. As stockholders of the company most men take a decidedly different view of things.

ALTHOUGH much time and money have been spent by steamship owners and operators in studying problems affecting the shipping industry, the people at the head of the industry in this country have lost sight of one very important, vital fact. The economic operation of ships depends first, last and at all times on the personnel. The finest equipped ship in the world could not be run economically unless the men in charge of the vessel had intelligence and took a real interest in their work and co-operated all the way down the line for economical operation.

The leaders of the shipping industry in our country might well tear a page from the records of some of the successful industrial leaders ashore. Many of these most successful men have dropped the autocratic method of handling their help and in various ways have succeeded in making their employees happy and contented.

Conspicuous among others, the United States Steel Corporation is making an effort to meet their employees half way. On the Great Lakes they operate a large fleet of vessels in the ore carrying trade and on these lake steamers the operators for the United States Steel Corporation treat their officers and men with the utmost consideration.

They are paying their officers a little more than the regular lake scale. They furnish the crews with excellent food, supply books and take an interest in any man who is injured or sick while in their employ. The captains of the various ships are consulted in regard to any change in policy affecting their ships. They are called upon to give their opinions as to whether certain men should be retained in the employ of the company or not, when such a man has been in an accident or has had other trouble, and in many ways they are made to feel that they are a part of the scheme of things. It would be hard to find a more loyal or efficient group of men than those who are employed on the steamers of the United States Steel Corporation on the Great Lakes.

This company also operates ships on the salt water where their men are treated, as a rule, with real respect and consideration but co-operation between the company and the men has not been developed to the same stage of perfection which prevails on the Great Lakes.

Captain J. F. Milliken

The Standard Oil Company is another company which has taken cognizance of the welfare of its employees. This company has developed a bonus system whereby the employees are rewarded for efficient service. They are also permitted to purchase a certain amount of stock in the company. The employee pays for half of this stock and the Standard Oil Company pays for the other half. The amount of money which the man pays is deducted from his pay each week and after a certain period of time the employee becomes full owner of his shares.

The plan of paying a bonus met with instant approval on the part of the men on the ships. Every man of the crew on a Standard Oil tanker is entitled to a bonus, if he remains on the ship a year. The Standard Oil Company decided some time ago that it was much cheaper to pay a man a bonus and to try to keep him satisfied with his conditions so that he would stay aboard a ship than it was to change the crews every trip. It is very easy for a new man on an oil tanker to turn the wrong valve and mix up a cargo of oil, or to stop the flow of oil into a tanker and break a pipe line and lose great quantities of oil overboard. Since the bonus plan has been in operation there have been very few changes of masters, chief engineers and first mates. The men are satisfied with their jobs, stand by the ships and they give the Standard Oil Company excellent service for their investment.

This company, it is true, is a little differently situated than most of the regular steamship companies. It is not necessary for them to chase all over the world for cargo and they are not dependent entirely upon shipping for their income.

Big Steamship Companies Disregard Employees

The big steamship companies in this country believe in exercising autocratic power over the men who work for them. Some of the owners pay the men the smallest possible wage that the traffic will bear. When it is necessary for a man to accept these small wages, in almost every instance he makes up his mind to stay on the ship only long enough to make a few dollars. In the case of an engineer, if he is aboard only for one trip, he will not do any more work than is absolutely necessary and he is liable to neglect very necessary things by "passing the buck" to the man who will relieve him. The same thing is true of the deck department where

*Secretary-treasurer, Neptune Association, New York.

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cargo plans have been lost and freights greatly confused by the changing of the deck officers. This continuous changing of crews is a costly thing and the lack of co-operation and understanding has cost steamship owners large sums.

It is easy enough for the shipowners at this time to disregard the men who work on the ships and to cut wages to such a low figure that it is impossible for the men to maintain a home ashore. If this practise continues, it will be the death knell of American shipping and no amount of subsidy or other aid will be able to save it.

SELECT BEST COMBINATION OF NATIONALITIES IN CREW

The personnel question on American ships is a more difficult problem than in other countries. Here we have a personnel which is composed of people from almost every nation on earth, and for that reason much careful study should be given to this very important phase of the shipping industry. The people who go to sea are human just the same as the people who stay ashore and, while many of the men who sail in our ships have become citizens, in many cases they retain their national characteristics. All of the officers are American citizens, or were after May 7, and as American citizens one man should have as much right as another. The spirit of fair play should prevail and for the good of everybody concerned the wise owner should make a study of what combination of nationalities work together to the best advantage of everybody.

The Eastman Kodak Company has developed a co-operative, profit sharing plan which is recommended to all industries. Questions of all kinds are discussed between the managers and the men, but Mr. Eastman has gone the usual plan of this kind one better. He has stated that the co-operative theory is all right but a few extra dollars in the pay envelope of the workers make for a real co-operation. If the Kodak Company makes a profit so that the shareholders receive dividends, the workers, or the men responsible for the production, also receive a dividend. The output of the Kodak plant has increased 25 percent under this plan and there has been no loss to stockholders or workers due to strikes.

From personal contact with troubles which have developed aboard ships, I have discovered that it does not pay to put an American captain, who originated in Great Britain, in command of a ship where the three mates originally came from Norway. In reviewing the cases of many seafaring men who are on the "deferred employment list" of the United States Shipping Board, I have noticed that much of the trouble was apparently caused by placing a man in command who had no sympathy or understanding with his officers. The lack of co-operation on ships which have been manned in this way has cost the Government a great deal of money.

UNJUST TREATMENT BRINGS RETALIATION

The captain of a ship has a responsible position. He is a buffer between the owner and the men, and in many cases he is made the goat and is forced to pay for something over which he has no control. In one case the captain of a ship was fined $100 because one of the engineers had pumped fuel oil into the harbor at Norfolk while the captain was away attending to the ship's business. The captain paid the fine and then tried to collect the $100 from the owner, who flatly refused to pay.

Making the captain pay $100 for an act for which he was in no way responsible killed all the co-operative spirit which he may have possessed previous to this incident. To get even with the owners he hired a pilot in every port where the ship entered or cleared. He was making a voyage to the West Coast and held pilot licenses which would entitle him to pilot his own ship into several of the ports but he was not in the humor to save money for the owners, even if it had been possible for him to do so. He also hired two tow boats to dock his vessel when it might have been possible for him to get along with one, and, if the vessel finished loading or discharging during the night, this man would not leave the dock as he was accustomed to do but would wait until the next morning and sail at daylight. On a voyage to the West Coast and back this same captain spent probably a thousand dollars which he might easily have saved, as he arrived in New York two days later than he would have arrived if he had been pushing his ship all the time. The owner, in this particular case, saved a fine of $100 but paid many times that amount for the lack of understanding and knowledge of the captain's duties, besides creating a feeling of distrust in the mind of the captain.

Another instance occurred where the operators made a special concession to obtain a contract to carry 2,000 tons of print paper to South America every month. On the first voyage over 12 percent of the paper was damaged due to poor stowage and rough handling. On delivery of the second cargo the damage was so great that the contract was concelled and the company lost about $3,000 where they should have received a substantial profit.

The officers and crews on the ships, as well as the stevedores, evidently lost sight of the fact that ships are paid to carry and deliver cargoes in good condition and that if this is not done the operators earn nothing. I know instances where the carelessness has been so flagrant and the damages so great that one could almost imagine that crews had been planted on the ship to destroy the trade.

If a business is always run at a loss, there is no money for employees, the company goes out of business and a number of positions are destroyed. The men should take an interest in their work and use every effort to put the American merchant marine on a paying basis. The best way I know of to awaken a real interest is to encourage the men to purchase a few shares of stock. As stockholders in the company most men take a decidedly different viewpoint of things.

STEAMSHIP OWNERS LACK VISION

I have been lead to believe that the present day steamship owners and operators have no vision when it comes to a question of personnel. It appears as if they were looking only for the profits of today and were making no effort to build up for posterity. At the present time there is absolutely no agreement of any kind between the owners and the crews of their ships. Some of the owners who have charitable hearts contribute generously to various institutions which are supposed to be maintained for the benefit of seafaring men. Some of these institutions are really charitable in their operation, but charity is not understanding and the majority of the seafaring men do not want something for nothing. Charity destroys a man's ambition, ruins his independence and kills his sense of responsibility.

It is a well-known fact that the steamship owners and operators in this country have many very trying and difficult problems. They are courageously battling against conditions which are much worse than any others which have ever been encountered in this or any other country before.

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Heroic efforts have been made by certain private owners and by the United States Shipping Board to keep American ships in operation but they have failed so far in enlisting the real co-operation of the sea-going personnel. Establishing clubs and associations of their own, which are poorly patronized and little thought of, will not bring to the operators the co-operation which they need so badly at this time. The shipping men of this country have many very serious problems to consider but they should not neglect the problems of personnel, for it will be almost impossible for the steamship business to prosper without the proper kind of men working harmoniously with the operators aboard the ships.

One of the most feasible ways to establish this co-operation would be to recognize the organizations which the men have built up and by making agreements with the men through these organizations and living up to such agreements after they are made. If the proper sort of co-operation had been in existence between the steamship owners and the sailors' union, Andrew Furuseth, in all probability, would not have appeared in Washington to wage such a strenuous fight against the ship subsidy bill, and the other associations which so heartily supported this measure would have been in a better position, financially and otherwise, to render this very necessary legislation more effective aid.

Economies Practiced by Successful British Shipowners

English Correspondent Outlines Methods of Effecting Operating Savings—Note Ease of Obtaining Concessions from Parliament

By Our British Correspondent

ECONOMY is at all times a praiseworthy endeavor, but never more so than when the fight goes to those who are able to effect a saving where others cannot—or at all events do not. I propose, in the first part of this article, therefore, to place on record some of the essentials leading to economies as practiced by successful shipowners. It should first be made clear, however, that there is no royal road to economy, that is to say, it is not an automatic process, but is a question on which considerable time and protracted deep-thinking must be expended.

One of the most noteworthy economies is in regard to insurance, and especially in connection with particular average. Only those owners with a good record extending over a number of years are able to arrange their insurance upon the cheapest lines, and even then much depends upon the age of the steamers. Owners possessed of a fleet of modern vessels are in a far better position than those who are handicapped with steamers of a greater age. Obviously it is a dangerous procedure for shipowners possessing, say, one or two vessels to run them unless fully covered against all risks, but, in the case of the larger ownerships, the particular average risk, varying from 50 percent to the whole of it, is, in fact, successfully undertaken. They have in the past probably been able to build up a substantial reserve fund, enabling them to look with equanimity upon the risk involved by running part or the whole of their own particular average, and which risk, spread over a fleet of, say, fifteen or twenty modern steamers, is a fair and reasonable one to take. With a company owning a single ship, or two or three ships, this is a risk or liability that cannot be legitimately undertaken, otherwise they might be faced at any moment with liabilities in consequence of particular average damage far beyond their resources. But it is quite another question when the risk is spread over a large fleet, and, without mentioning names, it is permissible to say that, as I have indicated, this procedure is engaged in by prominent shipowners in the United Kingdom.

Dispensing with freight advances is another direction in which important economies may be effected, but this is a difficult matter in such unpropitious times as the present, when owners in many cases have little option but to sacrifice appreciable sums in commissions.

Confining Vessels to Particular Trades

Then, owners may economize as a result of keeping their vessels in one trade over a series of voyages, and, furthermore, of confining the boats to the trades for which they are most suitable. For example, if a vessel is thoroughly fitted up for carrying grain, it is a paying proposition on economical grounds to confine her trading as entirely as possible to the carriage of grain cargoes. I have known of many cases where steamers have been diverted into other trades, probably by force of circumstances, and on returning to the grain trade owners have been staggered by the expense incurred in replacing shifting boards and grain fittings, especially in the North Atlantic trade. This is obviously a very real economy, but, as in the case of freight advances, it is again a question of owners being in a position to pick and choose.

Periodical surveys, too, should be watched in the matter of the carriage of certain cargoes, or heavy additional expense will be incurred in "passing through." In the British North America trade, many owners effect substantial economies by the payment of the extra premium of insurance immediately on the opening of the season, thereby enabling them to spread the premium over the season and work in several trips at the cost of one.

Superfluous Bunkers

Then there is the question of economies to be effected by ascertaining that the quantity of bunkers carried is not superfluous. In one case within my recollection there was a discrepancy of nearly 100 tons in the quantity of bunkers actually carried and the returns of the total deadweight (cargo and and bunkers) which were sent to the owners each voyage in accordance with instructions. The owners were for an appreciable time unable to lay their finger on the "spot," but eventually did so, incidentally discovering that the engineer, in order to be on the safe side, had been "nursing" a superfluous 100-ton margin on each voyage. He was "fired," and the carriage of bunkers was placed on an economic footing.

In regard to the general question of coal bunker economies in the matter of purchases, it was the practice years ago to contract ahead for quantities to cover several months, but the policy in these days is, owing to various causes, to live almost from hand to mouth. It is, on the face of it, an unbusinesslike method, but, with the present-day ups and downs, the measure has been found to justify its incidence.

Close Surveillance of Stores a Paying Proposition

Stores is another branch in which keen surveillance is imperative, and in which the expenditure of a salary to a sea-going man in the shipowner's office—usually a captain or chief engineer who has been many years in the service—has proved to be a paying proposition. The larger companies,

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of course, possess in most cases a marine superintendent, and are, therefore, in safe hands—if they possess the right type of man. But in the smaller fleets down to single-ship and two-ship concerns, where the appointment of a marine superintendent in the generally accepted sense of the term is impracticable, it undoubtedly pays to have a man in the office who can point his finger to items in the captain's inventory renewals and say: "This is unnecessary," or "That is essential." The average landsman would be "at sea" with such a list before him, but not so the man who has been to sea and who knows to a rope what is required and what is not.

In the matter of shelter deck vessels there is also scope for economy, for, unless intelligence is shown in the selection of cargo, this type of vessel is at some economical disadvantage to a single deck vessel. It is a fact that many shelter deck steamers seldom run in the trades for which they are specially suited, but here again force of circumstances is probably the deciding factor. It is significant, however, that keen and discerning time charterers, who study expenditure in every detail, decline to take double decked steamers where a single decker is preferable.

Concession in Shipping Fees Bill Secured

A direction in which British shipowners as a body have effected an important economy since my contribution appeared in this magazine a month ago is in regard to the short and sharp fight around the provisions of the Shipping Fees Bill. This measure, embracing charges for such services as the measurement of tonnage, surveys, and so on, imposed, in its original form, an annual charge on shipowners of £420,000 per annum, as against the £90,000 yearly charge hitherto incurred. But, as a result of representations made to the President of the Board of Trade by the Shipowners' Parliamentary Committee, working in conjunction with the Chamber of Shipping of the United Kingdom, a substantial concession has been secured, and in the bill as amended the annual charge is reduced to half the original sum, that is £210,000, or £120,000 per annum more than shipowners have thus far paid. The bill in its amended form is now receiving the approval of shipowners, and the measure will, there is little reason to doubt, eventually find its way to the Statute Book. The burden of the charges may be gaged from the following new maximum scale provided in the schedule to the bill:

MEASUREMENT OF MERCHANT SHIPS

	£	s.	d.
Vessels of 50 tons gross and under	2	0	0
Over 50 tons gross and under 100 tons	4	0	0
Each additional 100 tons or part of 100 tons above 1,000 up to 10,000	1	0	0
Each additional 100 tons or part of 100 tons above 10,000	0	10	0

PASSENGER STEAMER'S CERTIFICATE

Steamer not exceeding 50 tons gross	4	0	0
Exceeding 50 and not exceeding 100 tons gross	8	0	0
Exceeding 100 and not exceeding 300 tons gross	12	0	0
Exceeding 300 and not exceeding 600 tons gross	15	0	0
For every additional 300 tons or part of 300 tons above 600 an additional	3	0	0

SURVEY OF EMIGRANT SHIPS

For ships holding valid passenger certificates:			
Ordinary survey	12	0	0
Special survey	20	0	0
For ships not holding valid passenger certificates an additional fee			

REGISTRATION, TRANSFER AND MORTGAGE

On initial Registry:			
Vessel not exceeding 25 tons gross	2	0	0
Exceeding 25 and not exceeding 50 tons gross ..	2	10	0
Exceeding 50 and not exceeding 100 tons gross ..	3	0	0
Exceeding 100 and not exceeding 200 tons gross	4	0	0
With £1 for every additional 100 tons or fraction of a 100.			
On transfer, transmission, registry anew, transfer of registry, mortgage, and transfer of mortgage. According to the gross tonnage represented by the ships or shares of ships transferred, etc.	£	s.	d.
Not exceeding 10 tons	0	5	0
10 tons and not exceeding 20	0	10	0
20 " " " 30	0	15	0
30 " " " 40	1	0	0
40 " " " 50	1	5	0
50 " " " 75	1	10	0
75 " " " 100	1	15	0
100 " " " 125	2	0	0
A further fee of 5s. for every additional 50 tons, or part or 50 tons, up to 500 tons, after which for every 100 tons, or part of 100 tons	0	5	0

New Development in Marine Boilers Designed to Increase Economy of Operation

MARINE boilers have certain limitations which are not found in land plants; therefore, a boiler to meet marine conditions must meet the limitations aboard ship. The principal requirements of marine boilers different from that found in land practice are space, weight, steady steam demand, feed water and to some extent character of the personnel which is usually not as well trained as the average shore engineer.

In land plants it is usually customary to have spare equipment to meet the varying load conditions found during the peak loads, but this is not necessary or desirable aboard ship. First because the load or steam demand is fairly constant, and second, space and weight available prohibit spare boilers. It is desirable, therefore, to design marine boilers for a fixed steam capacity which will give the maximum economy and to operate them at that capacity constantly while at sea.

Owing to there being no spare boiler equipment, reliability is the most important factor in a marine boiler. Both weight and first cost have in the past been sacrificed to reliability, as is evidenced by the great number of Scotch marine boilers that have been used. Many attempts have been made to use watertube boilers, and in recent years this type of boiler has been more frequently installed in spite of the fact that it requires a better grade of feed water and more intelligent operation than the older Scotch marine type.

New Type of Superheater and Economizer

To meet marine conditions and obtain the same economy which is now found in the large central stations ashore, a new development in marine boilers has recently been brought out by the Foster Marine Boiler Corporation. They have improved their boiler with a new type of superheater and economizer arranging all three devices in one compact steel casing as shown in sectional side elevation, Fig. 1.

The principal change in the boiler heating surface proper has been made in reducing the height of the tube bank and increasing it in width, also in depth. This gives a low wide boiler, adds approximately 50 percent to the water storage in the boiler proper, giving it nearly the same water reserve as the Scotch marine type. Also by lengthening the tubes a greatly enlarged furnace volume is obtained, and the space available aboard ship is taken up more efficiently. Another interesting feature of the heating surface is the opening up of the lower rows of boiler tubes to allow the radiant heat to penetrate further into the tube bank, thus reducing the load on the lower row of tubes which, it is claimed, will overcome most of the present difficulties found with burning and blistering of these tubes when scaled. This is clearly shown in Fig. 2.

The general design of baffling as shown in Fig. 1 is the well known Foster steel plate type in which the baffles are cooled by the boiler tubes top and bottom. With this form

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of baffling, it is claimed, if any repairs should be required in the lower row tubes, there will be no repairs or renewals required by the baffling.

The furnace design is radically different from present practice as a Foster radiant heat type superheater is installed in the rear wall, which enables any degree of superheat desired to be obtained and reduces considerably the furnace temperature. Repairs in the brickwork furnace lining will be reduced, it is claimed, due to the cooling effect of this furnace wall superheater in conjunction with the extra tube surface exposed in the lower rows of the boiler.

BOILER IS PRIMARILY AN EVAPORATOR

The steam boiler should be primarily an evaporator and not a combination of feed water heater and evaporator. Many land plants have installed economizers to add the required sensible heat to the feed water up to or close to the temperature of the steam, which leaves to the boiler only the work of adding the latent heat of vaporization. The boiler heating surface is best adapted for evaporating work only, and the separate heating surface of an economizer is best adapted for reducing the temperature of the stack or waste gases to the minimum point and adding the sensible heat of the water before evaporating. This splitting up of the heat absorbing surfaces into two parts, a boiler and an economizer, results in a material gain in economy at a moderate increase in cost and, if the water velocity in the economizer is kept at its proper rate, most of the scale forming matter, such as carbonates, etc., will be deposited on the economizer surface as a soft mud, and will not pass into the boiler where it would be baked on in the lower row tubes as a hard scale. The addition of the economizer also gives a large storage of hot water available for immediate use which results in steadier steaming and also helps the water reserve of the complete unit. This new Foster combined unit with its economizer has a larger water storage, it is claimed, than the present Scotch marine boiler.

The efficiency of this new Foster steam generating unit will be increased, it is claimed, as the waste gases leaving the economizer will be from 250 to 300 degrees Fahrenheit instead of from 500 to 600 degrees as found in present marine boiler practice. Assuming an average stack temperature of 550 degrees as now practiced and 300 degrees with the new boiler, there will be an approximate fuel saving of 7½ percent, as generally it has been shown by experiment that there is a reduction of 1 percent in fuel used for each 30 to 35 degrees reduction in stack temperature. There will be a further gain due to the heat absorbed by the superheater. This gain, through increased or higher superheat than is now used, will be mainly shown in the engine or turbine where all of the superheat appears in useful work. Reducing the stack gases to the lower temperature possible with this new boiler unit will not only help to increase the economy when proper combustion is maintained in the furnace, but in the case of inefficient operation such as when large quantities of excess air are used will tend to reduce the losses of inefficient operation due to more of the heat in the excess air being absorbed by the economizer before passing to the stack. In other words, the losses due to inefficient operation will not be as great owing to the final temperatures being nearer to the original temperature of the air used for combustion than is found in present practice.

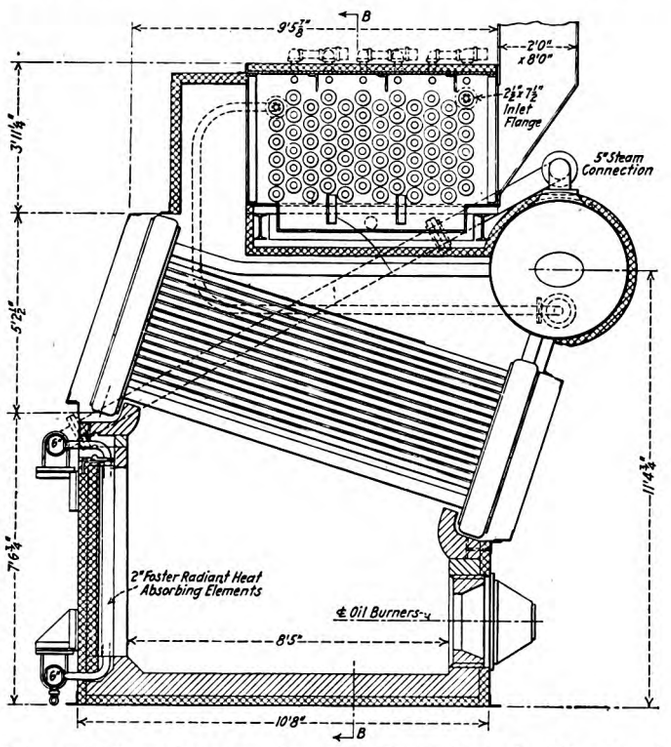

Fig. 1.—Side Elevation (Section Through A-A, Fig. 2) of Foster Marine Watertube Boiler with Superheater and Economizer

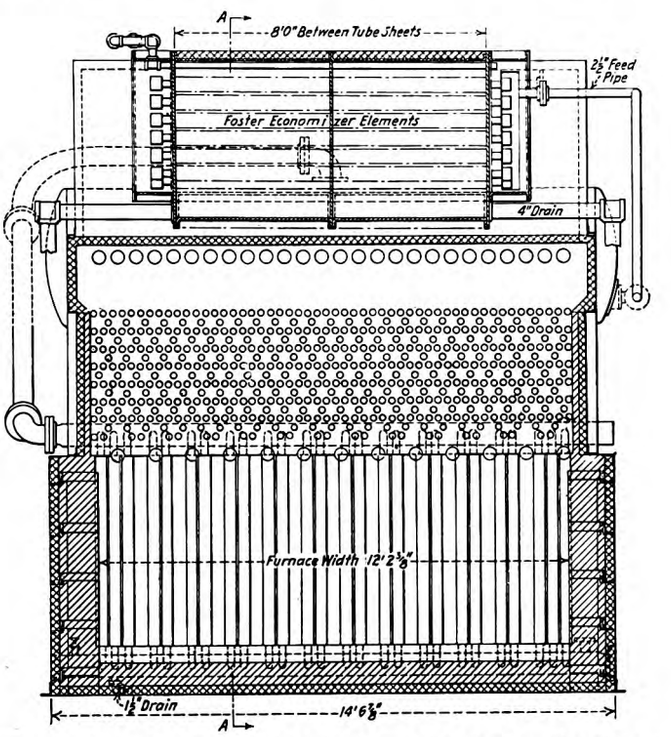

Fig. 2.—End Elevation (Section Through B-B, Fig. 1) of New Foster Marine Boiler, Designed for 250 Pounds Working Pressure and 150 Degrees F. Superheat

BOILER EFFICIENCIES

The new Foster improved boiler unit, it is claimed, will have an efficiency of from 85 to 90 percent depending upon the fuel used and the completeness of combustion. Its weight and space required will be approximately the same as the present Scotch marine type, its gas outlet being at about the location of that of the Scotch type which lends itself to the shortest flue to a central stack.

Marine fuels are more expensive than in the past and, therefore, fuel economy is of greater importance than before the war. With approximately 600 pounds pressure and 250 degrees superheat a modern marine steam plant, it is claimed, can produce power for the same fuel cost as a Diesel engine.

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Effect of the Propeller on Economical Ship Operation

By E. A. Stevens, Jr.*

It is not generally realized what a significant part the propeller plays in the efficient and economical operation of ships. It is just as important *to reduce* the horsepower required at a given speed and draft as it is to reduce the fuel burned per indicated horsepower. Change in propeller sometimes means a saving of 15 percent in the fuel. The examples given in this article are good illustrations of the savings that can be effected by installation of properly designed propeller wheels.

TO obtain economical results, two things are required: first, to reduce the fuel per indicated (or shaft) horsepower, and, second, to reduce the power required to drive the ship at the desired speed. The result of the two is to get the greatest mileage per ton of fuel. In many cases the second point is overlooked and, when the machinery is being operated quite efficiently, it is the more important of the two.

Two things can be done to reduce the power required to drive a ship; one is to keep the underwater body of the ship clean, the second is to make a change in the propeller where it is not giving good results. By making this change, the speed can often be materially increased and at the same time the fuel consumed per day reduced.

Where Reciprocating Engines Were Installed in Place of Turbines

During the war a large number of ships were built that were intended to be driven by geared turbines with a propeller speed of 90 revolutions per minute. In many cases reciprocating engines were installed in place of turbines, but no change was made in the propeller or the position of the tail shaft. The result was that the engines were not able to operate under economical conditions, and, in order to prevent them from running at too high a number of revolutions, they were never allowed to obtain full power.

In some cases the pitch was increased in order to correct this fault, until a new propeller could be made and installed. This increasing of the pitch, however, made it necessary for the engines to deliver more power as the propeller was working in what is generally known as "cavitation" of the kind that Admiral Dyson calls "dispersal of the thrust column." However, the total fuel consumed was, in some cases, less, as the engines were working under more favorable conditions. The wear and tear was also reduced. In most of these cases the location of the shafting was such that it was impossible to put on a wheel of the proper diameter, and therefore broad tip blades had to be used.

Illustrations

Example 1. This ship was fitted with a propeller of the following characteristics: Diameter, 17 feet; pitch, 15 feet 9 inches; projected area ratio, .342; number of blades, 4. From the trial results it was discovered that this wheel was working in cavitation so a new wheel was designed. As the diameter was limited to 17 feet 6 inches it was necessary to broaden the blade tips. The new wheel had four blades, a pitch of 15 feet and a projected area ratio of .36.

The maximum speed obtained on the trial with the old propeller was 9.41 knots with 2,126 indicated horsepower, while with the new wheel it is estimated that this speed could be obtained with 1,930 indicated horsepower, a saving of 9¼ percent. To maintain a sea speed of 10 knots it is estimated that with the old wheel the power required would be 3,080 indicated horsepower (which was impossible with the boilers and engine) while only 2,610 indicated horsepower would be required with the new propeller, this being a saving of 15¼ percent.

Example 2. This ship was originally fitted with a four-bladed wheel of 16 feet diameter, 14 feet 6 inches pitch and a projected area ratio of .368. With this wheel she made 8.23 knots at sea in smooth water and burned 42 tons of coal in 24 hours. The above wheel was replaced with a four-bladed one with broad tips, the diameter of which was 17 feet, pitch 15 feet 3 inches and the projected area ratio was .392. A speed of 9.25 knots was obtained with this wheel while the coal burned was reduced to 38 tons per diem. The saving in fuel was 9½ percent, while the effective horsepower delivered by the propeller was increased about 40 percent.*

Example 3. This ship was fitted with a four-blade propeller, the pitch of which was 19 feet. On the trial trip a speed of 11.19 knots was obtained with 2,695 indicated horsepower and 69.75 revolutions per minute. The mean referred pressure was 39.2 pounds. As this wheel was working in cavitation a reduction of the pitch to 17 feet would have reduced the indicated horsepower required to 2,555, increased the revolutions to 74 and reduced the mean referred pressure to 35.2 pounds. This would mean that the engine could be run with advanced cut off in the high pressure cylinder, thereby reducing the water rate, while the revolutions would not be excessive. At sea the saving in power would be even greater than that mentioned above.

Although examples 1 and 3 are estimates, it is believed that the actual results will be practically as shown. These were calculated by the Dyson method of propeller analysis and design which the writer has found to be quite accurate. Some of his investigations were shown in a paper presented last fall at the Transactions of the Society of Naval Architects and Marine Engineers entitled, "The Application of Dyson's Method to Propellers of Ocean Going Merchant Ships."†

Saving Can Often Be Made By Changing Pitch

Very often a saving can be made in the fuel bill by changing the pitch, thereby increasing or decreasing the revolutions without decreasing the power required to drive the ship. This was done in the case of a geared turbine driven cargo ship where the pitch was reduced from 14 feet 6 inches to 13 feet, which resulted in a saving of 10 percent in the fuel, while the power required was about the same for the same speed and draft.

Another case is that of an 8,800-ton deadweight cargo ship that was fitted with a very large reciprocating engine, the low pressure cylinder of which had a diameter of 80 inches and a stroke of 48 inches. The propeller was a four-bladed wheel of 17 feet diameter, 15 feet 9 inches pitch and a projected area ratio of .34. The power re-

*Senior Engineer in Charge of Propeller Work for Emergency Fleet Corporation.

*After making allowances for conditions of ship's bottom.

†Reprinted in Marine Engineering and Shipping Age, April, 1923.

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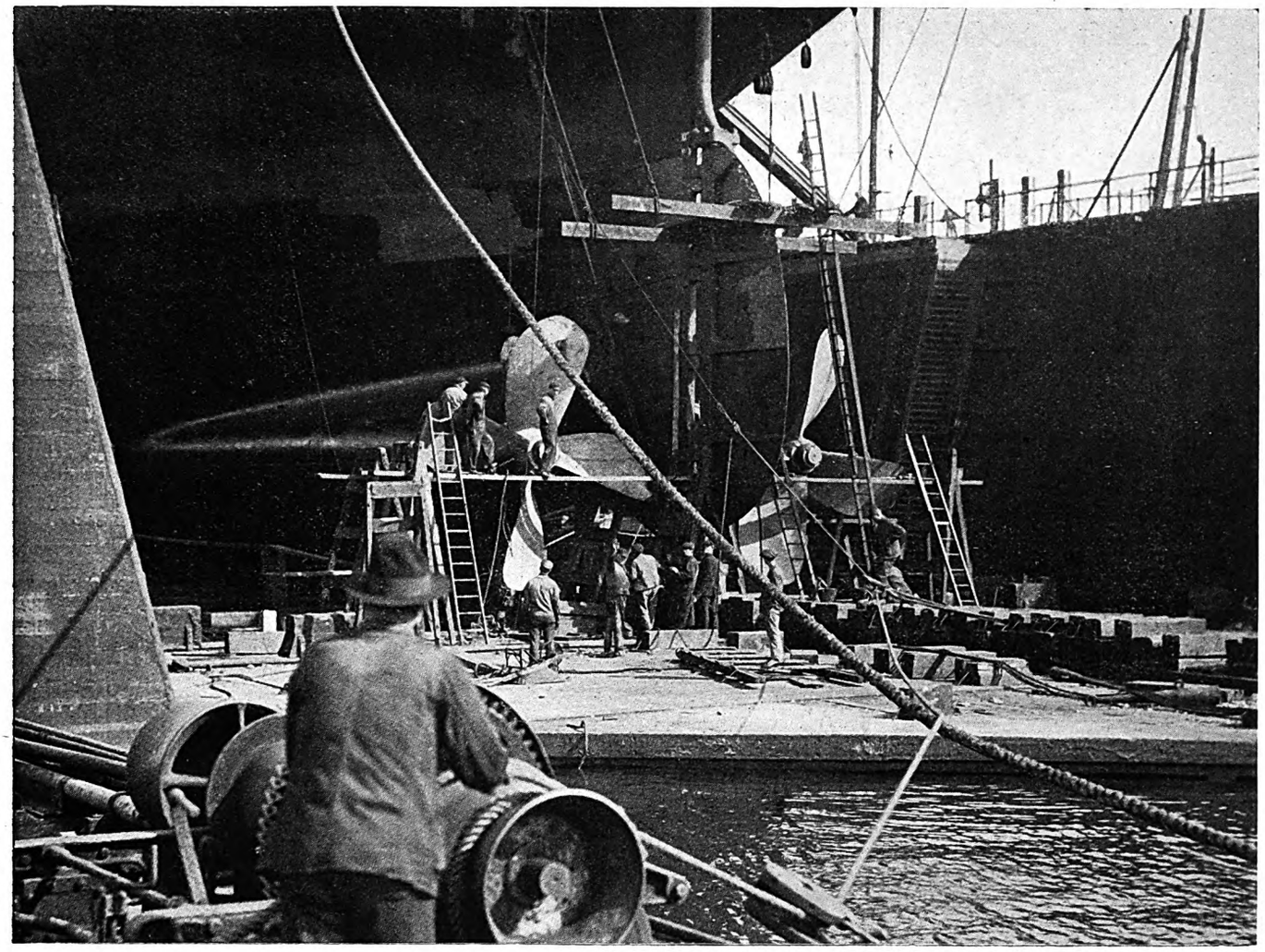

Removing Propellers on Twin Screw Passenger Steamer in Dry Dock

quired to drive this ship at a sea speed of 10½ knots was about 2,620 indicated horsepower, and the revolutions per minute, about 77.5. This would require about 27.9 pounds mean referred pressure. It was not considered advisable to run this ship at a greater speed on account of the high number of revolutions. As no larger propeller could be installed a broad tip wheel is being made with the same diameter as the old one but with 16-feet 9-inch pitch and a projected area ratio of .39.

It is estimated that with this propeller 2,680 indicated horsepower would be required to obtain 10½ knots at sea, while the revolutions would be about 71.5 and the mean referred pressure 30.8 pounds. With this wheel a speed of 11 knots could be obtained with about 75 revolutions per minute. While the power required for 10½ knots is increased about 2½ percent the engine will be working under better condition, and the fuel burned will probably be much less, while the wear on the engine will be considerably reduced.

Two Common Fallacies

Before closing, I wish to call attention to two very common fallacies. The first is that low slip means a high efficiency. While this is true in some cases, it is not always so. For instance, two ships, one having finer lines than the other, both having the same power and revolutions, the one with the finer form will run with more slip while the propulsive efficiency will be greater as the power augment factor (generally called the thrust deduction factor) would be less. In the case of high speed propellers, increasing the diameter will result in decreasing the slip, but the efficiency will decrease after a certain diameter is reached.

The second fallacy is that a pitch ratio of over unity is necessary in order to obtain high efficiency. While it is true that high propulsive efficiencies are generally found where the pitch ratio is over unity, it is not due to this but to the fact that the hull in such cases is so shaped that the flow of water to the propeller is not disturbed enough to materially increase the power required had the propellers been operating in undisturbed waters. It has been mentioned on more than one occasion that in both destroyers and freight steamers where the pitch ratio is about 0.8 that the propulsive efficiency is not generally over 53 to 54 percent.* This is true, but it should not be overlooked that there is a difference between propulsive efficiency and the propeller efficiency.

In the case of the destroyer the power augment factor is unity, therefore the propulsive efficiency is the same as the propeller efficiency. The low efficiency, however, is not due to the low pitch ratio, but to the high tip speed and thrusts. In the case of the freight steamer the low efficiency is due to the effect that the hull has on the flow of water to the propeller which, in many cases, increases the power at least 25 percent over that required if the propeller was not so affected, so, if the propulsive efficiency in this case is 54 percent, the propeller efficiency would be 67.5 percent, which is about as good as can be expected. The pitch ratio from what has been said can be considered an incident and not a cause.

* Propulsive efficiency = E. H. P. ÷ I. H. P.; if E. H. P. ÷ S. H. P. is used, these figures would be 57.6 to 58.7.

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An Economizer That Requires No Outlay

High Grade Lubricating Oils Intelligently Used in the Engine Room Will Promote Efficiency and Cut the Operating Bill

THE cost of poor marine lubrication is disastrous. An attempt to economize on the first cost of lubricating oil for ship machinery is about the most expensive mistake in which an operator can indulge. It is a fuel waster, a speed destroyer, a booster of repair bills and a loser of profits.

When a turbine driven vessel such as the *Robin Adair* is able to show a log of 170,000 miles on the low speed unit where the tooth pressure is 1,000 pounds per lineal inch without appreciable wear, the machinery must have been properly lubricated.

One hundred and eighty thousand miles without replacements of any kind has been recorded by the double reduction geared turbine ship *Niels Nielson.* Proper oil and efficient operating methods are entirely responsible for such a showing.

The adoption of a high grade lubricant will effect a direct saving in consumption as evidenced by the cost sheet of the motorship *Renfield* where the oil consumption was reduced from 28 gallons of lubricating oil a day to 14 by a change in the quality of oil used.

The record of the trial trip and maiden voyage of the steamship *Alleghany* of the Furness Withy Line contains an interesting example of the results possible from the adoption of efficient engine room lubricating methods and quality oils. On her trial trip this ship exceeded her contracted speed, making 14.7 knots, developing about 3,000 horsepower. From Liverpool to Boston on her first run she averaged 14 knots and consumed only 4 gallons of lubricating oil per day.

How do these ships get results—what are the methods and the oils used in efficiency performances of this nature?

Only Small Quantities of Oil Needed

If all the oil used on marine equipment accomplished its function without waste, comparatively small quantities would be necessary. Oiling at regular intervals should be the rule of the staff. When fed by hand the oil film will cling to bearings and continue to perform its function for a limited period. With an automatic feed, regulated carefully, the consumption can be kept low while accomplishing a maximum effect. In circulating systems where repeatedly purified by mechanical or filtration methods, lubricants last indefinitely, requiring but small quantities for replacement, provided the quality of the oil is correct for this service. With the idea of adequate lubrication without waste in mind, the high grade oils for given uses become the most economical.

The first cost of a lubricant is of comparatively minor importance, however, when the effect of lubrication on the machinery is considered. The slightest delay in port made necessary by burned out bearings or any other cause due to faulty lubrication rapidly overtops the lubricating oil bill covering a long period.

Places Where Friction Losses are Greatest

In reciprocating engines where the problem is largely one of external lubrication, the opportunity for conserving oil through a careful study of oiling methods is great. From the engine to the propeller, friction losses occur in the piston, packing glands, crossheads, valve gears, eccentrics, main bearings, crank pins, thrust bearings, line shaft bearings, stern tube stuffing box and stern tube bearings. The problems of maintaining bearing adjustments, piston clearances, spring tension and the like at exactly the correct point to prevent overheating and, at the same time, eliminate pounding are too well understood to require comment. It is sufficient to say that the maintenance of shaft alinement and careful adjustment of moving parts is the first duty of the staff. On the matter of selecting the proper lubricant and feeding it to accomplish the best results there is a vast field for the improvement of methods now generally employed.

NOTE—The information used in the preparation of this article was supplied by the Vacuum Oil Company and the Texas Oil Company of New York.

Methods of Internal Lubrication of Reciprocating Steam Engines

The internal or cylinder lubrication of reciprocating engines is accomplished by a variety of methods—hand oiling, tallow cups, hydrostatic lubrication and mechanical forced feed instruments.

The inefficiency of oil cups as a method of cylinder lubrication is evident. The cup is filled, the cover replaced, the cock at the base opened and the oil permitted to flow into the cylinder or the steam chest. This system lacks regularity, results in a waste of lubricant and demands frequent attention. With hand swabbing, using cylinder oil, the rods and packings are well lubricated but this method is hardly satisfactory for cylinder and valve lubrication. The practice of swabbing the rods requires regularity and only with an oil of absolutely correct quality will the lubrication of an engine by this method be satisfactory.

Such an oil must have great spreading ability, the properties necessary for maintaining a lubricating and sealing oil film under high pressure and temperature, the ability to resist the washing effect of cylinder condensation, the quality to furnish maximum lubrication with a small supply, non-carbonizing properties and the ability to quickly separate from condensed steam in order to avoid boiler troubles.

If oil of the same quality were introduced into the steam line by means of a mechanical force feed lubricator in quantities much smaller than those required for the inefficient hand swabbing method, correct lubrication of all parts would be assured without danger of introducing any oil into the boiler.

Effects of Various Lubricating Methods

For use when starting an engine or when there is a tendency for internal parts to squeak, hand oil pumps are often installed. With this method more oil than is actually required is pumped into the engine with the usual result that the excess finds its way into the condenser with the exhaust steam. The hand pump must always be used with careful judgment.

The hydrostatic lubricator is connected to the main steam line and depends for its action on the replacement of oil with condensate from the steam line. This type of lubricator must be started and stopped by hand. It is not absolutely regular or uniform in its delivery of oil, as changes in temperature, leakage or an obstruction in the delivery passage alter the rate of feed. It must be kept under observation to insure good results.

Force feed lubrication is accomplished by the use of a mechanical lubricator, consisting of an oil reservoir and a small plunger pump for each oil feed, operated by a lever and ratchet motion which is attached to some moving part of the engine. There is a sight feed glass by which the rate of feed may be observed. There is also some means by

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which the stroke of each plunger may be regulated to increase or decrease the feed.

When a good type of mechanical lubricator is selected, this method of lubrication is automatic and absolutely regular in its delivery of oil. The stroke may be adjusted to deliver any desired quantity of oil and by trial a very high degree of economy can be attained. Temperature changes do not influence the feed of a good mechanical lubricator.

TYPES OF OIL BEST ADAPTED TO PROPELLING MACHINERY

For the lubrication of the marine steam engine two oils are necessary, one for steam cylinders, valves, valve and piston rods and packing glands, and one for crosshead guides, wrist pins, crank pins, main bearings and valve gear.

The high steam temperature and pressures employed, require the use of a heavy bodied cylinder oil which must form a lubricating and sealing film, even when moisture is present. Adhesion to the friction surfaces in the presence of moisture is most commonly obtained by compounding the oil. In the case of marine engines, however, compounded oils are generally considered objectionable because they do not readily separate from the water of condensation in the hot-well, in which case the boilers become coated internally with oil, resulting in poor heat transfer and overheated metal. For this reason a highly refined mineral cylinder oil is generally used which has been manufactured from selected crudes by methods adapted to develop its adhesive and lubricating characteristics to the greatest possible degree.

There is no given set of rules applicable to the lubrication of ship machinery or a specific oil or grease that is standard for any and all services. There are fundamental principles of good lubricating practice, however, and suggested applications of various oils especially adapted to particular types of machinery in the following outline of the lubrication problem that will suggest possible economy measures to the operator and to the engineer.

For the lubrication of the external parts of the marine engine, friction and wear are reduced to a minimum and the bearing temperatures are kept within reasonable limits best by the use of a high quality heavy bodied compound lubricating oil. While it is sometimes attempted to describe such an oil by specifications, giving the viscosity and other physical characteristics, the only satisfactory basic for the selection of an oil for this purpose is the established service record of the oil. Manufacturers who specialize in high grade lubricating oils may be consulted to advantage and it is generally safest to accept the results of their extended experience in the selection of the oil.

Although the oils selected in this way may cost more per gallon than would another oil, correct lubrication can be attained by their economical use, resulting in less expensive lubrication in the long run than by the use of a cheaper and less suitable lubricant. A further and greater return to the operator is the decrease in repairs and increase in useful life of the engine, as a result of correct lubrication.

STUDY OF WICK FEED OILERS PROFITABLE

In connection with the lubrication of bearings and external engine parts, the opportunity for improvement in the use of wick feed oilers is considerable and in a large measure depends on the work of the individual engineers. As with other methods, the rate of feed should be maintained practically constant and only of sufficient volume to lubricate the bearings adequately. This is seldom if ever accomplished. When the cup is full the oil flows freely, dropping off as the level falls. If at the low levels the bearings are receiving sufficient oil, then when the rate of flow increases with the higher levels the conclusion must follow that oil is being wasted. It is almost safe to make the statement that nine out of every ten wick feeders supply more oil than is necessary, that is, assuming high grade oils are used. The possibility of changing the number of strands in a wick and of determining the proper length wick to give the correct flow and avoid fluctuation is of great importance. It has been determined that the lower end of the wick adjusted at a distance of about 2 inches below the lowest oil level will increase the uniformity of flow at all levels. Greater wick lengths than this do not alter the effect appreciably, while if the wick is much shorter, there will be an excessive variation of oil flow between fillings.

The study of wick feeders can be carried to the point of taking out the strands of the wick, one at a time, watching the effect on the bearing temperatures and, when the bearing begins to overheat, replace one strand of wick for safety. Once the proper balance is obtained, the flow will remain practically the same if the lubricant used is of the same quality.

The lubrication of the thrust bearing is extremely important, since this bearing takes the entire driving force that propels the ship. There are three general types of thrust bearings; first the plain type, in which the thrust rings or collars fixed on the shaft are fitted in recesses in the lower and upper bearing sections; second, the horse-shoe type, in which the thrust rings bear against collars of horse-shoe shape, which can be adjusted separately; the third, bearings of the Kingsbury, Michell and Gibbs types, which are specially designed to assure automatically the even distribution of pressure on the bearing surface. The plain type is used in some small installations, the horse-shoe type is very common in reciprocating engine installations of all sizes, while the special types of the third group are common in modern steam turbine practice and are meeting with increasing acceptance for reciprocating steam and Diesel installations.

For lubrication of thrust bearings the common methods of application are oil bath and wick feed oilers. Plain and horse-shoe thrust bearings generally have an oil bath. The revolving collars pick up oil from the bath and force its circulation through grooves, from which it is distributed. For starting, oil is delivered to the bearing surfaces by wick feeds, which are generally provided, assuring that the bearing will not be scored before the oil from the bath is properly distributed. The special types of thrust bearings mentioned are generally lubricated by bath, sometimes supplemented by forced circulation of the oil. The oil reservoirs of large thrust bearings are often provided with water cooling coils for maintaining moderate oil temperatures.

Where plain or horse-shoe thrust bearings are oiled by bath or wick feed, a rich lubricant with heavy body should be employed, correctly compounded so that it will form a lubricating emulsion with any water that may be present. These requirements usually call for the same oil as should be used for the main engine bearings and guides. Occasionally, when the duty of the thrust is especially severe, a still heavier and more strongly compounded oil will relieve the difficulties encountered.

It is specially important that the oil used on the plain and horse-shoe type of thrust be of a high grade, well adapted to this particular service, because an unsuitable oil will not attain a satisfactory emulsion. Under continued operation this emulsion will tend to become heavier and heavier, until the oil ways become so clogged that the only lubrication remain-

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ing is that furnished by the wick feed oilers. Overheating and loss of the bearing is the probable result. This condition of the oil necessitates cleaning out the bearing and renewing the oil. The correct oil for this purpose will form a fairly thick emulsion, still retaining its flowing and lubricating qualities during long periods of service.

The special types of thrust bearings mentioned are nearly always constructed with a tight casing which keeps water out. The use of a large oil reservoir for the bath also facilitates the separation of any water that may accidentally enter the bearing. The bearings may be well lubricated by the use of a pure mineral oil of lighter body than that for the other types of bearings. For turbine installations this is generally the same oil as that on the main turbine bearings. The use of a high quality oil for this purpose assures long useful service.

Oil Requirements for Tunnel Bearings

The general type of tunnel bearing installed in connection with the average reciprocating steam engine is of the plain spring type. Tunnel bearings are generally lubricated with marine engine oil or a tunnel bearing grease or both. If oil is used it is ordinarily applied by means of wick feed, the top half of the bearing cap being built with an oil box cast in it. A good oil can be reclaimed and used several times.

Where grease is used in the tunnel bearings it is comparatively hard in composition, having a very high melting point. Grease lubrication may keep the bearing surfaces in good condition, but always results in greater frictional power loss than with the use of a suitable oil. For this reason bearings built for grease lubrication are often fitted with wick feed trays, made to fit the grease recess, so that oil can be applied.

Turbine Lubricant Requirements

The high surface speed and small shaft clearances in direct connected turbines require a light bodied oil that will circulate readily. It must also be of the proper quality to maintain an oil film with minimum fluid friction on the turbine and thrust bearings.

Direct connected turbine drive vessels are not economical, as the turbine must be run at too slow a speed and the propeller at too high a rate for efficiency. Turbo-electric drive ships are not in extensive use so the discussion of the lubricating problem will be confined to geared drive vessels.

Reduction gears may be either single or double. A usual ratio of speeds in double reduction gears is 3,500 revolutions per minute on the high speed shaft, 500 revolutions on the intermediate and 100 revolutions on the low speed shaft. Herringbone gears are in general used for reduction although straight tooth spur gearing has been used to some extent.

The oil that would normally be selected for the turbine bearings alone is sometimes of too light a body for the reduction gears, where the tooth pressures range from 500 to 750 pounds per linear inch. The duty of the oil in the gears is not only to maintain a lubricating film, but also to form a cushion that will prevent shock and wear on the tooth surfaces. Since it is generally impractical to use separate oils on bearings and gears, a reasonable compromise is made by using an oil throughout, which is of sufficient body to satisfy the gears requirements. The oils that have been found most satisfactory for this service have a viscosity between 250 and 300 seconds Saybolt at 100 degrees F. On slow running gears which normally have higher tooth pressures, and on gears poorly cut or badly worn, heavier oils are sometimes found advantageous.

Oils as heavy as the foregoing result in unnecessary fluid friction in cool bearings. In many geared turbines, the bearings are so located that they are kept warm due to the heat from the turbine. The effect of this is to reduce the operating body of the oil, creating a condition such that the heavier oil selected for gear lubrication also satisfied the bearing requirements without causing excessive fluid friction.

It must never be assumed merely because an unknown oil has a viscosity within a prescribed specification range, that it will give satisfactory performance in the turbine. For long continued satisfactory service there is no place where it is more important than in the steam turbine to employ a high grade oil that has been carefully developed for the exact performance intended. A safe choice cannot be made on the basis of any set of specifications. No laboratory tests are equal to the service results accumulated from the records of many machines of the class, covering long periods of time.

Systems of Lubrication Employed

The most important factor in arriving at good lubrication of turbine units is the provision of a thoroughly reliable system both for the turbine and the gears. Pressure and gravity circulation systems are most extensively employed for oiling. In the gravity circulation system, the lubricant is carried to a gravity tank located high enough to obtain about 15 pounds' pressure which is necessary to supply the parts to be lubricated. The oil is then permitted to flow through the bearings and gears to the sump. The oil from the sump is returned by means of a pump through strainers, a separator and a cooler, to the gravity tank, thus providing a constant circulation of the lubricant. A gravity circulation system in a steam turbine usually contains about 1,800 gallons of oil, while a pressure circulation system contains somewhat less oil because of the elimination of the gravity tank. Because of the fact that the oil is constantly in motion in these systems a special kind of oil and a special treatment of that oil must be provided.

The pressure system of lubrication is cheaper than the gravity since less equipment is required. In operating this system, the lubricating oil pumps draw the oil from the sump or drain tank or purifying system and apply it to the unit under pressure, the oil draining back to the drain tank where it is again picked up by the pumps and again applied to the unit. The circulation of oil through this system is therefore continuous.

The proper quantity and quality of lubricant must be maintained in the turbine system and for the auxiliaries. Some pressure installations are fitted to operate with too low a capacity of oil. On the average ship the system should be of ample size to handle from 800 to 1,000 gallons in continuous circulation. Certain units at present are operating under as low as 400 gallons in the system and this provides so rapid a circulation of oil that after it has come in contact with the heated bearings it does not have time to settle and cool and therefore is subject to rapid deterioration. To function properly, the pressure system should pump oil to the bearings in excess of that required, a relief valve or other means being provided to drain the excess oil back to the sump tank.

In turbine driven vessels the oil that is used for the main drive may also be used for most of the other service on board. The average replacement of new oil should not exceed 15 gallons per day in ordinary cargo ships.

On ships equipped with refrigerator spaces three types of oil in general are required—that for the main turbine drive and auxiliaries, ice machine and possibly cylinder oil. As the lubricant used in the steam turbine system must be a straight mineral oil it is not considered wise to carry a supply of oil on board that will emulsify, not even in cases where horse-shoe thrust bearings are used because of the possibility that this oil might be accidentally placed in the turbine system where it would cause trouble.

An excellent method of controlling the treatment of oil is to place a sample from the low point in the turbine system in a long small clear glass bottle for observation. The sample is allowed to settle for four hours and each engineer is thus able to maintain an accurate check on the condition of the oil and any changes that might have occurred in the system.

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If water is getting into the system, it may thus be discovered immediately and the cause of the water determined and the evil eliminated or given the necessary attention.

The oil used must separate easily and quickly from water and other impurities picked up in the system. Water in the system with the oil tends to form an objectionable mixture that clogs the screens and forms a slime on the cooling coils, thus reducing the efficiency of the cooler as a heat-extracting device. In extreme cases, the free circulation of the oil is interfered with by the slime so formed, and lubrication is affected.

SYSTEMS OF PURIFYING THE OIL BY FILTRATION

Three methods of filtering the oil in the lubrication system may be resorted to. In the periodic batch filtration system, the entire charge of oil in the system is drained at definite intervals when, in the judgment of the operator, it is deemed advisable to recondition the oil. After all the oil has been drained from the system and the parts thoroughly cleaned, new oil is introduced. To filter used oil it should be heated to a temperature of from 160 to 180 degrees F. which hastens the water separation and improves the purity of the oil when subjected to filtration. This method requires two or three days for completion and so is not generally applicable.

In the continuous filtration system all the oil is passed through a combination settling and filtering tank. The quality of the oil is effectively maintained in this way while the large volume used in the system provides a relatively long time for settling out impurities. The filter should be cleaned of impurities regularly.

The continuous by-pass system of filtration provides for a small quantity of oil to be constantly withdrawn from the system through a small filter and returned to the sump. This oil is taken from the lowest point in the sump tank or from the bottom of the gravity tank where solid impurities or water will naturally be found. If impurities are present, idle periods may be utilized to recondition all of the oil. With this method oil can be in continuous service for several months without appreciable deterioriation.

Centrifugal oil separators may also be used in conjunction with any system of filtration. They provide a satisfactory method of purifying oil at sea and a positive system for purification when in port. In even a moderate sea the gravity settling system is rendered inefficient by the motion of the ship, while under favorable conditions in port the pressure of gravity is not sufficient to effect complete purification. With the centrifugal system it is possible to purify the oil continuously or by the batch method as desired.

The arrangement commonly used places the purifier on the same level as the turbines. When it is operated continuously with such a system the course of the oil is roughly as follows: Coming from the turbine bearings it flows into the oil drain tank and is pumped by either of two steam pumps through the oil cooler into one or the other of the two overhead tanks shown at the right of the diagram. From a point slightly above the connection of this tank the oil flows back through the strainer to the turbine. A stream of oil is constantly drawn from the bottom of the tank and passed into the purifier where water, dirt and other sludge are centrifuged out. The purified oil is delivered into the drain tank and goes back into the overflow tank along with that coming from the turbine bearings.

FACTORS DETERMINING SERVICE OF LUBRICATING OILS

When starting up a new turbine for the first time, there are always present in the system impurities of many kinds such as core sand, scale, chips, fibers, etc. It is good practice after the trial run to remove the entire supply and subject it to filtration or centrifugal purification.

It is well to keep a check on the records of oil consumption in order to eliminate any irregularities caused by leakage of water in or oil out. Evaporation losses are relatively small in a turbine system, particularly as the oil temperatures, reduced by the cooling, are much below the temperature of vaporization.

Oil foaming in the system may be due to air leaks. Where foaming persists it may be prevented by the use of vents in the oil tanks and by operating at higher oil temperatures which has a tendency to cause the bubbles to break up quickly. Water finds its way into the circulation system in spite of every precaution and the careful construction of packing glands. Constant supervision must be maintained to keep down the amount of water present. Water and a highly refined oil emulsion will readily separate when allowed to rest. When an inferior grade of oil is used, however, in which finely divided insoluble substances are present, an emulsion of a permanent nature is formed. To prevent this, pure mineral oil of high grade and special manufacture must be used. The elimination of emulsion and sludge from a circulation system is necessary to maintain the proper efficiency of the oil, as these impurities will precipitate in the oil reservoir, in the strainer or filter, on the cooling coils or in the bearing housing, all seriously affecting the reliable operation of the turbine.

The lubrication of Diesel engines and auxiliary machinery will be discussed in a later issue of this magazine.

The Leviathan—The New Flagship of the American Merchant Marine

WHEN our next issue reaches its readers, the reconstructed *Leviathan*, now the largest ship in the world, and perhaps the fastest liner afloat, will be ready to sail on her maiden voyage from New York to Cherbourg and Southampton as the flagship of the American merchant marine. In the hands of the Newport News Shipbuilding and Dry Dock Company, and with the aid of a host of subcontractors, this vessel has been completely reconditioned so that she represents the last word in safety, luxury and convenience for travelers at sea. In the July issue of *Marine Engineering and Shipping Age*, will be published a complete profusely illustrated description of the passenger accommodations of this magnificent contender for the blue ribbon of the seas. Details of the structural changes and the reconditioning of the propelling and auxiliary machinery of the vessel were published in our November, 1922, issue.

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New Furnace Front for Dahl Oil Burner

Greater Accessibility and Better Air Regulation Secured by Swinging Feature of New Front

A NEW type of swinging furnace front has recently been developed by Bethlehem Shipbuilding Corporation, Ltd., for use in installations of the Dahl mechanical oil burning systems, which are manufactured at their Moore plant, Elizabeth, N. J. This front is suitable for use with either natural or forced draft, or with a combination of both. The swinging feature of the new front, in addition to retaining all of the desirable features of the non-swinging type, possesses special advantages in regard to accessibility and air regulation that the other type does not.

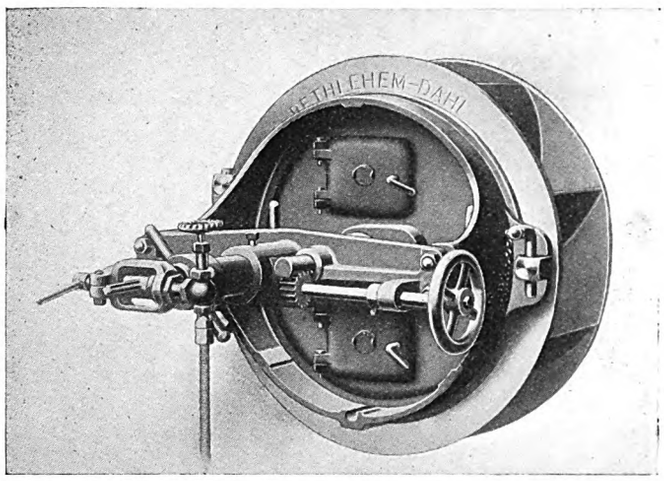

Fig. 1.—Swinging Type Furnace Front for Natural or Forced Draft Installations, Shown in Operating Position

The air register is a substantial cylindrical casting having nine air vanes cast integral with two flanges of rugged design, the front one of which acts as support for the swinging part, the rear one being bolted to the boiler furnace front.

A cylindrical regulating pot air check governs the amount of air admitted by opening and closing the air inlet. The air regulating pot is controlled by means of a hand-operated rack and pinion.

The cylindrical air regulating pot and air regulation pot head are separate castings, clamped together by two dogs. The air controlling gear and cone adjusting gear are the same in both swinging and non-swinging types.

The swinging front permits of air regulation when working under natural draft, forced draft, or combined natural and forced draft, and under all conditions of operating it may be swung open to permit of easy access to the furnace interior without dismantling any part of the boiler front. When working on natural draft installation, the cylindrical air regulating pot and air regulation pot head are one casting. Regulation of the air is accomplished by adjusting the air regulation pot. In this case the air is admitted through the register vanes which are open to the boiler room.

Withdrawing the pot and pot head along a cylindrical bracket placed in the center of the crossbar, by means of the rack and pinion, and swinging them open permits of inspection and easy access to the interior of the furnaces without dismantling the boiler front or fuel oil piping.

When operating under forced draft, the register is enclosed by the air duct, and adjustment for air control is by means of the rack and pinion which operates the air regulating pot and pot head. Closing the air regulating pot over the register vanes cuts off the forced draft and permits of swinging the air regulating pot head, burner and regulating cone clear of the register for inspection without destroying draft conditions on other furnaces being supplied from the same duct. The swinging clear of the pot head and door frame permits of inspection and access to the furnaces without dismantling the furnace front or fuel oil piping. To do this, the two dogs are thrown clear of air regulating pot, the latch bolt is disconnected and the air regulation pot head is withdrawn from the air regulating pot. While these various movements are taking place, the air regulating pot seals the register, thus preventing leakage of air during examination of burner and regulating cone.

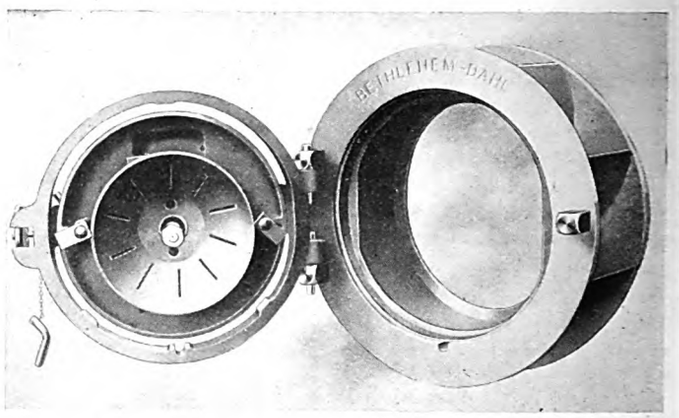

Fig. 2.—Swinging Type Furnace Front in Open Position with Air Regulating Pot in Closed Position, Showing Easy Access to Furnace Interior

When working under natural draft on a combined forced and natural draft installation, the air regulation pot remains in the closed position shown in Fig. 1, shutting off the forced draft through the air duct. The two dogs are disconnected and the air regulating pot head is withdrawn for the admission of air, by means of the hand operated rack and pinion, thus giving a definite air control.

If for any reason it is found desirable to admit a still greater quantity of air, the two doors in the air regulating pot head can be opened. Access to the interior of the furnace is obtained as described above.

A number of installations of this design of furnace front have already been made with excellent results, demonstrating ease of operation, flexibility of control of air regulation, complete atomization and high efficiency resulting in a practically smokeless flame and the highest attainable percentage of CO_2 at the stack.

Arc Welding Applied to Shipbuilding

BEGINNING in the July issue of *Marine Engineering and Shipping Age*, Mr. E. W. Ewertz, general manager of the Moore Plant, of the Bethlehem Shipbuilding Company, Ltd., will present a complete summary of the application of welding to ship construction, a comparison of welding with riveting, a description of the arc welded ships already in existence and their performance, a review of repairs to the German liners and the results of tests in England and the United States to demonstrate the adequacy of welding as applied to ship construction, a description of the several designs of welded ships, a comparison of the advantages of welding versus riveting and finally a bibliography of the subject.

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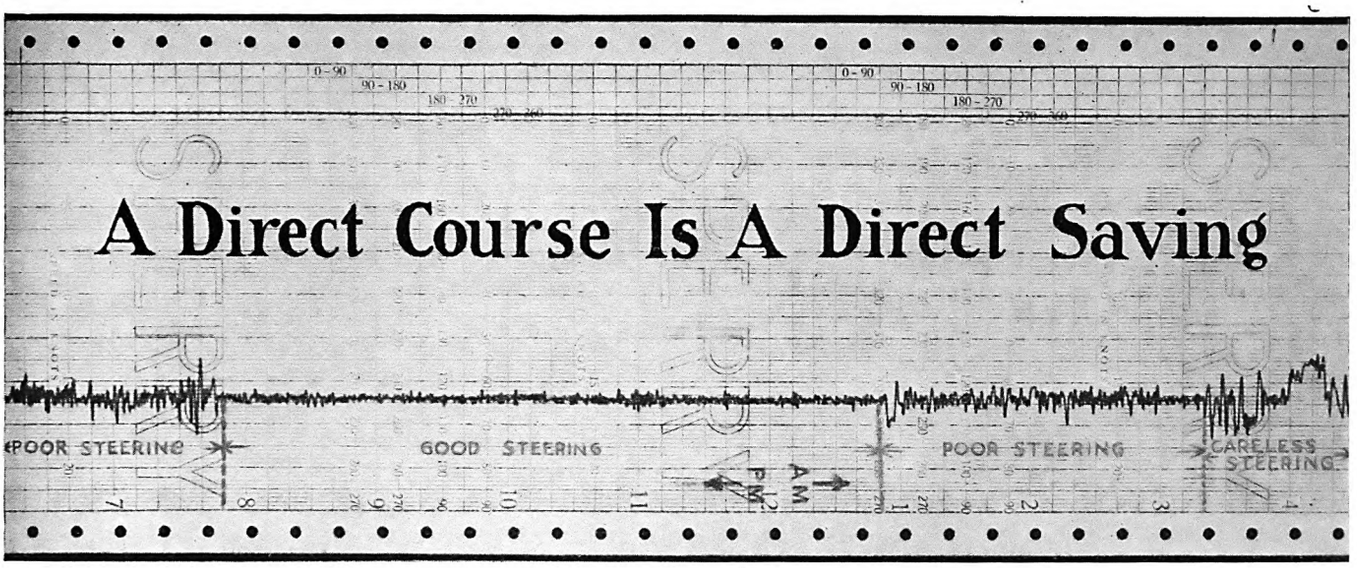


A Direct Course Is A Direct Saving

By Robert B. Lea*

All the carefully worked out engine room and shore economies are seriously affected if the captain of a vessel is not able to direct his ship over the shortest ocean course between ports.

GREAT advances have been made in the last century in the art of ship propulsion, but there have been no corresponding contributions to aid the captain and commander of a vessel. In fact the advances in the engine room in several respects have increased the captain's burden of responsibility, for the greater speed which modern machinery has given to vessels has gone beyond the power of the feeble magnetic compass to respond as quickly as it should. Secondly, the metal and machinery which have replaced the old time wooden hull and sails have introduced grave magnetic disturbances, the compensation for which robs the magnetic compass of much of its already feeble directive force. For this reason the gyro has long been indispensable on war vessels and over one thousand ships of the world's navies are using the gyro compass. Here the compass is used not only for navigation but to direct the very accurate gunfire control.

Directly after the war the gyro compass was first tried in the merchant service and its contributions found to be so unique and substantial that already 36 of the world's leading fleets have vessels navigated by gyro.

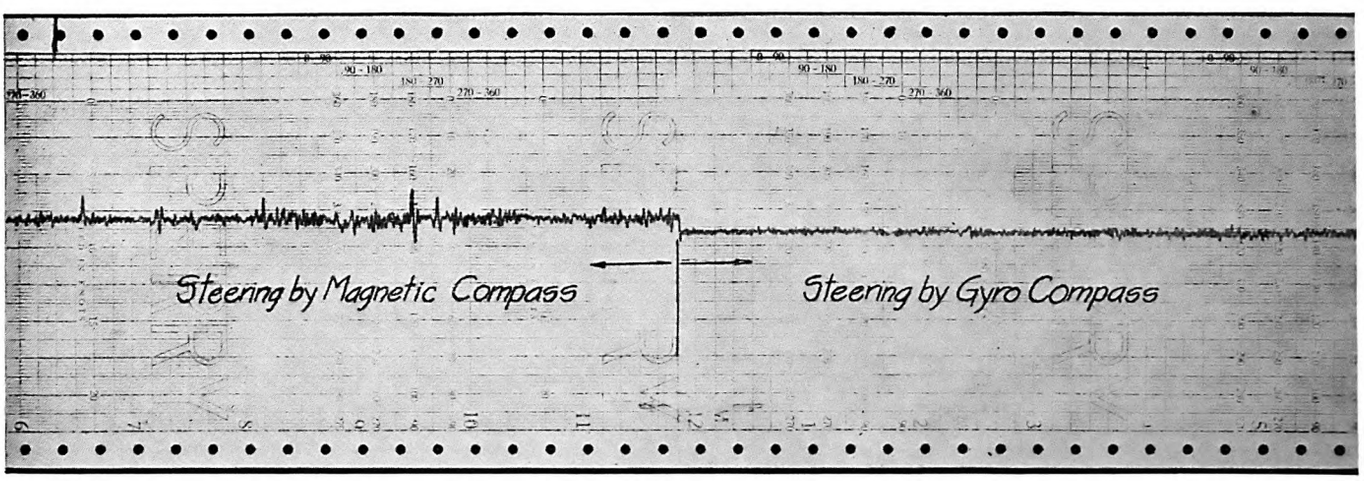
*Manager, Marine Department, the Sperry Gyroscope Company, Brooklyn, N. Y.

Advantages of Gyro Navigation

The economies and advantages of gyro navigation can be briefly stated as follows:

First, the gyro compass makes possible true north navigation. For the small gyro wheel in the master compass ever maintains its axis with a definite relation to the earth's axis, thus affording freedom from those ever-present worries—variation and deviation. The elimination of these two factors does much to reduce the mental hazards of the navigator. And every aid is worth while which will simplify the responsibilities of the master of a modern vessel representing the large capital investment that it does.

Secondly, since the gyro compass is so many times more powerful than the magnetic it responds to the slightest yaw of a vessel, thus enabling the quartermasters to steer a much straighter course. An idea of the difference in directive force is given in the treatise as published a few years ago by Commander T. A. Lyons of the U. S. Navy. The Sperry



Comparative Records Made on Oil Tanker

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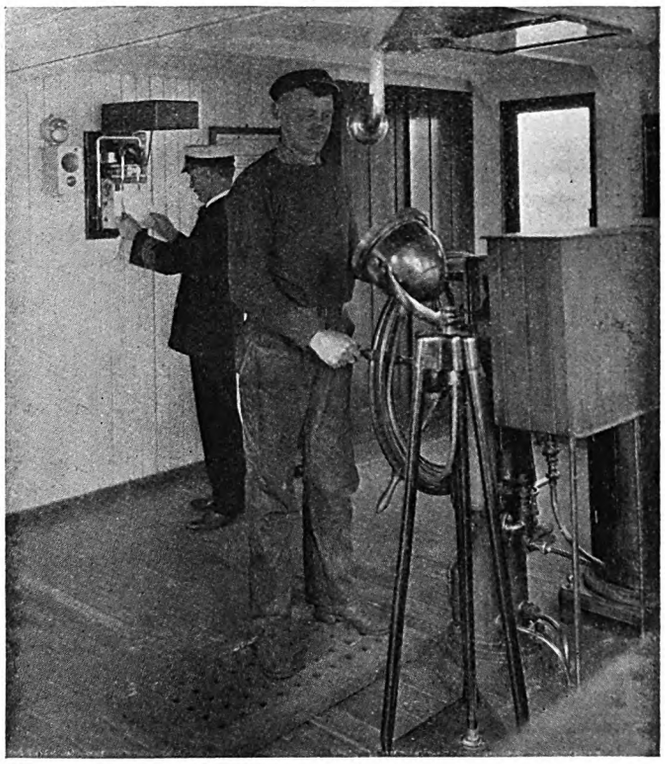
Mk VI, or merchant type compass, has 137 times the directive force of the U. S. Navy standard 7½-inch liquid compass used in the tests.

The accompanying illustration shows comparative records made by a tanker. It will be noted that the vessel was yawing on an average of about 5 degrees when steered by magnetic and this was immediately reduced to an average of 1½ degrees when the quartermaster was allowed to steer by gyro.

A ship appears to be ever anxious to yaw off her desired course *without really changing her direction of motion.* Unless she is prevented from doing this by the prompt action of helm, she cuts a much wider swath through the water. This, of course, means power loss. One large transatlantic liner reports a saving of 1½ to 2 percent of fuel consumption due to straighter steering.

Another economy results from this straighter steering which is brought about by a more prompt application of the helm



Steering by Gyro, Captain Examining Course Record in Background

than is the case with the sluggish magnetic: namely, a smaller amount of rudder is used. This affords an appreciable reduction in the number of propeller revolutions required to drive a vessel a given distance and can be readily realized by those who have observed the retarding effect of drag from a rudder at wide angles. One coastal liner finds that she now requires on an average of 5,000 fewer revolutions on a run of about 900 miles.

DEAD RECKONING MADE ACCURATE

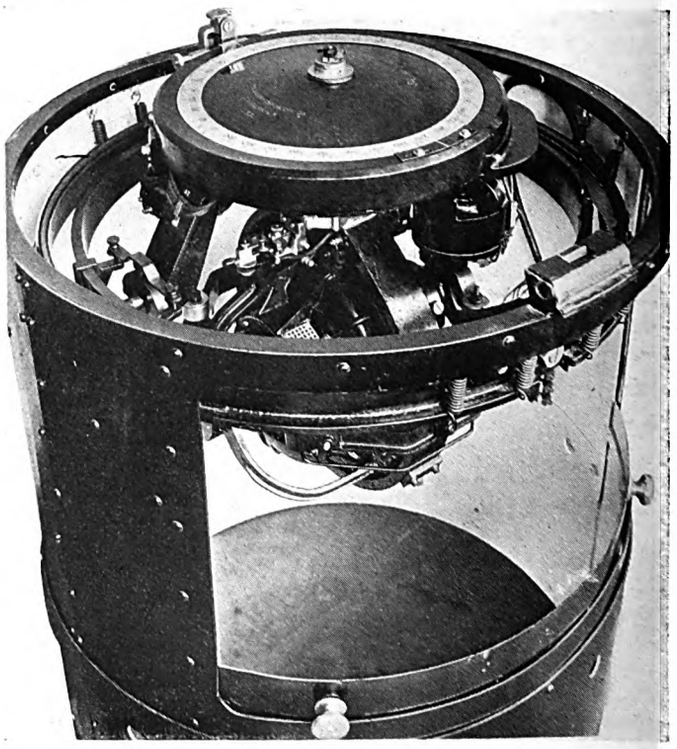
The third contribution of the gyro compass to economy is the ability of a captain to more accurately navigate by dead reckoning, especially when the weather is such that check sights cannot be taken. This is perhaps best expressed in the report of a captain of a large intercoastal freighter:

"I wish to state without any hesitation that never before have I seen a vessel make the courses or the landfalls that I have seen made this trip. When I expected to make a light at such and such a time and bearing such and such a degree, true to form there it would be right on the dot. If I figured

Steering Repeater, Reveals a Yaw of One-Sixth of a Degree

to pass five miles off of that light when abeam, five miles it surely would be.

"I read somewhere that dead reckoning with a gyroscope was raised from an indefinite quantity to a mathematical accuracy and I want to corroborate that statement. Since leaving New York I have steered between 15 and 20 courses and upon recapitulating find that the course made good in



Master Gyro Compass. This Instrument Controls Steering Repeater, Bearing Repeater and Course Recorder

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all but two instances has always been the exact course steered by gyro. This, to me, is a phenomenal surprise."

Or perhaps the following taken from a foreign technical paper:

"Not the least interesting of the many up-to-date appliances shown to me on board was the Sperry gyro-compass, which, by giving a more precise line of route unaffected by magnetic deviation, saves the ship about 80 pounds sterling a trip."

Another advantage of special interest to the management on shore is that the gyro compass makes possible the use of a machine that records every heading or change of heading of a vessel over a long period of time.

COURSE RECORDER ELIMINATES INEFFICIENCY

The latest "course recorder" affords a continuous record for 30 days on a single strip of paper. Several companies have already made use of these records in court where the visual evidence was of great value in proving the position and heading of a vessel at the time of accident. The presence of this instrument in the wheelhouse has been found to serve as a continuous moral stimulant to the quartermasters' alertness. What is more important, it enables a captain to eliminate inefficient wheelsmen with their costly steering, for it is found that some men seem unable to acquire the knack of holding a vessel closely to a required course.

The chart reproduced at the beginning of this article shows this striking difference in quartermasters while the vessel was proceeding under the same weather conditions.

"METAL MIKE"

To carry these savings further, the Gyro Pilot, or automatic steering device, has been developed and is about to be introduced. This mechanism has greater alertness than a quartermaster in giving a vessel the proper helm. And neither does "Metal Mike," as this iron quartermaster has been dubbed by captains, get tired after a two-hour watch, or become drowsy around 4 a. m. On several ships thus equipped the wheel has not been touched by human hand for days at a time.

The fifth type of saving is effected when pilots, through their greater confidence in the gyro compass, particularly when making sharp channel turns, bring their vessels up through the fog or haze to the dock when otherwise they might feel inclined to drop anchor. Many instances of this are reported, such as a recent case where a captain was able to land his passengers in the late afternoon while another vessel approaching the entrance buoys at the same time, but not equipped with a gyro compass, felt obliged to drop anchor until morning. This gain in time for unloading mails, passengers and cargo may well represent large sums.

It is thus interesting to realize that the principle of the street vender's toy has been put to work and contributes to the more economical and safer navigation of merchant vessels.

Oil Engines Designed for Large Liners

Seven Thousand Brake Horsepower Double-Acting Motors and 3,000 Brake Horsepower Single-Acting Plant

By Our Special London Correspondent

DURING the past two or three years, interest in oil engine construction has chiefly been centered around motors of moderate power and, generally speaking, up to about 2,000 brake horsepower. It is probable that this represents the widest field of application for marine internal combustion machinery but, in view of the demand that has arisen for motor passenger liners, considerable attention has lately been devoted to the production of engines of high power.

Undoubtedly the most noteworthy example is the new Burmeister and Wain double-acting four-cycle type. As previously mentioned, two motors of this design of about 7,000 brake horsepower are to be installed in a passenger liner for the Swedish-American Line, and it is now possible to give some details and illustrations of the 1,100 brake horsepower single-cylinder experimental engine which the builders have constructed, before proceeding with the manufacture of six-cylinder sets of practically the same design.

HIGH PISTON SPEED ADOPTED

The engine develops its power at 125 revolutions per minute and has a bore and stroke of about 33 and 59 inches, respectively. It will be noted that this gives the exceedingly high piston speed of between 1,200 and 1,250 feet per minute, whereas in most of the marine Diesel engines that have previously been built, the figure has seldom exceeded 800 or at most 850 feet per minute. With their wide experience, Messrs. Burmeister and Wain would not have adopted such a piston speed, if they were not confident of its suitability, but it is generally considered that piston ring wear is a function of speed, and it will therefore be interesting to learn whether any difficulties are encountered in actual service. It should be added, however, that equally high piston speeds have been employed in submarine engines for some years past, so that the development is not entirely novel.

The cylinder cover at the top of the engine is more or less normal, with exhaust, inlet, air starting and fuel valves operated from long push rods from the camshaft in accordance with Burmeister and Wain single-acting practice. In the bottom cylinder cover, however, only three valves are located: The exhaust, inlet and starting air valves. There are two fuel valves, but these are arranged horizontally in a distance piece between the cylinder cover and cylinder. Through these, fuel is injected tangentially at points almost diametrically opposite, on account of the interference of the piston rod. It will be realized that the power developed at the bottom of the piston is not equal to that on the top, owing to the fact that the piston rod passes through the combustion chamber, and that the net effective cylinder diameter is correspondingly reduced.

Although the engines in the liner will be fitted for the ordinary system of fuel injection by compressed air, they will not drive their own air compressors. Separate Diesel driven units of 600 brake horsepower will be installed in the engine room for this purpose and in this way, a higher shaft horsepower will be developed for a given cylinder dimension than would otherwise have been possible. It is estimated that the consumption on each of the 7,000 brake horsepower motors will be in the neighborhood of 30 tons daily.

SINGLE-ACTING ENGINES FOR NEW GERMAN LINER

The highest powered Diesel engines built in Europe for installation in a ship have just been completed and have

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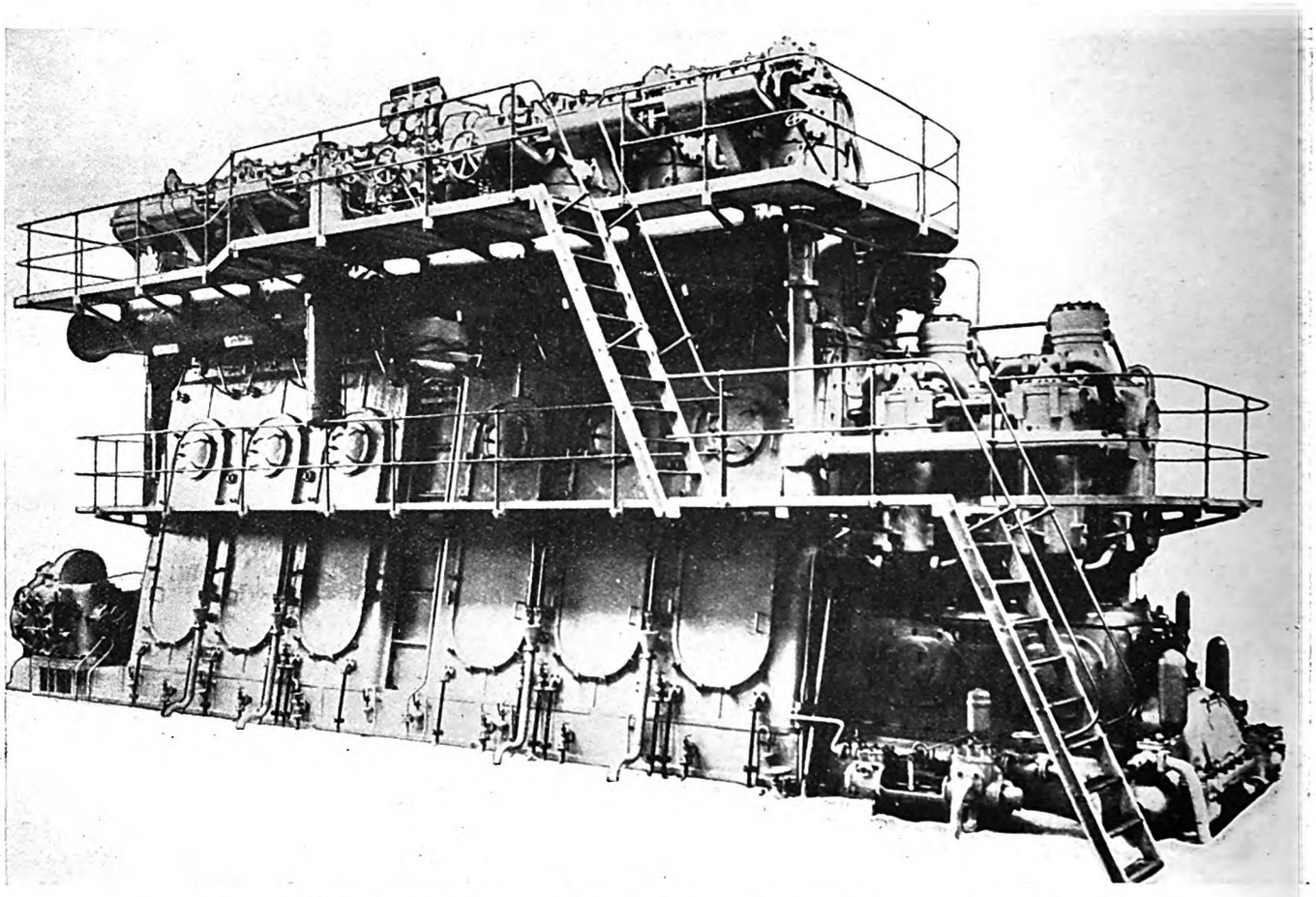

One of Two 3,000 Brake Horsepower Sulzer Engines to Be Installed in the German Liner Fulda

been installed in the new 9,500-ton transatlantic passenger liner which the North German Lloyd is building for its service between Bremen and New York. These motors, of which an illustration is given, are of the Sulzer type and are normal two-cycle single-acting sets developing their power at 100 revolutions per minute. They have six cylinders, 680 millimeters bore with a stroke of 1,100 millimeters and it will be observed that although two injection air compressors are driven off the crankshaft, there is no scavenging pump. This is in accordance with the latest Sulzer practice. In the ship, the scavenging air will be provided by two rotary blowers, each driven by a 300 brake horsepower motor, running at about 2,750 to 3,000 revolutions per minute. The total power absorbed for supplying scavenging air to two propelling engines of 6,000 brake horsepower will, it is estimated, be under 250 brake horsepower.

In these engines, the scavenging air, at a pressure of 1.4 pounds per square inch is admitted as usual through two series of ports, the upper row giving a super-charge after the exhaust ports are closed. The starting air and fuel valves are arranged in one housing, so that only one hole has to be provided in the cylinder cover, and the valve gear, operated from an overhead camshaft, is comparatively simple. As the illustration shows, the control gear for the engine is arranged at the level of the top grating, a system that is now almost universally adopted in Sulzer engines. There is, however, a good deal of auxiliary machinery at the engine room floor level, and in case of necessity, the main engines must be capable of control when the engineer is below. A lever is therefore arranged which will enable the attendant to stop either of the propelling engines, if it is so desired, when he is at the bottom of the engine room.

The engine drives its own lubricating oil pumps and also an additional pump, supplying oil at a pressure of about 250 to 300 pounds per square inch to the crosshead bearing. This arises from the fact that the pressure on this bearing is not relieved during every revolution, as is the case with a four-cycle single-acting motor. The main cooling water pumps are separately driven, one being provided for the cylinder jackets, in which sea water is used, and another for piston cooling, fresh water being employed in this instance.

The trials on these engines appear to have given remarkably good results. The fuel consumption for the engine alone works out at about 0.395 pound per brake horsepower, while, if the power needed for driving the electrical auxiliaries be added, the total consumption varies between 0.41 and 0.42 pound per brake horsepower. The passenger liner in which the two engines will be installed, named the *Fulda*, is being built by the Weser Company at Bremen, and will have a cabin accommodation for about 870 people, the majority of the cabins being arranged for third class passengers.

Another passenger liner of 12,000 tons gross is being constructed in Germany by Blohm and Voss for the Hamburg South American Line and in this case also, twin screw machinery of between 6,000 and 7,000 brake horsepower is to be installed. The engines are, however, being constructed by Blohm and Voss, and will be of the normal four-cycle construction as developed by this firm in conjunction with the M. A. N. of Nürnberg.

Origin of Fires on Board Ships.—According to a recent notice given to shipowners and shipbuilders by the British Board of Trade, which analyzed 241 fires occurring during one year on British ships, 70 percent of the fires occurred in bunker spaces, 12.1 percent were due to oil fires, including launches, and 17.9 percent were due to miscellaneous and other causes, including superstructure and engine room fires.

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Tuning Up the Engine and Boiler Room—II

Written on Board the George Washington as a Good Example of What Can Be Done with Existing Ships

By William L. Bunker*

THE air pumps are of various makes and types, the latest and best known being the vertical type pump fitted with a large brass plunger and a properly sized bronze cylinder. It is fitted with foot, bucket, and head valves. There is also the independent air pump, either of the duplex or simplex type, fitted in the same manner and the Edwards type which consists of a solid brass plunger with only one set of valves and is usually called the displacement type of air pump.

Air pumps should be examined periodically, either monthly or not exceeding 60 days, care being taken to see that packing in the plunger, which is usually flax and sometimes of brass rings, is in good condition. The valves which of recent years are of a close grain bronze, should be examined to see if they are cracked or warped, and that valve seats, guards, etc., are in good condition and not loose or unduly worn.

From the air pump the feed water is discharged into a hot well or very often a filter box. The latter is a tank with sufficient compartments, one or more of which are filled with absorbent material to soak up any grease that is in the feed water. It then passes through to the feed pumps on its way to the boiler.

Feed water filters are usually constructed with several compartments or in duplicates so that one can be shut off while it is being cleaned and the water passed through the other while this process is going on. Aloofa sponges, cocoa mats, excelsior and other material is used in these feed water filters and in plants where, on account of superheated steam or for other reasons, lubricating oil is fed inside the cylinders this absorbent material should be changed at least twice a day and in many instances every watch of four hours. When a longer time is allowed to elapse the object of a feed water filter is lost and the grease passes to the boilers.

Feed Pumps

The feed pumps are usually in duplicate and large enough so that half of the installation can handle the feed water at full speed. Therefore, the overhauling of these pumps can be done at sea without a shutdown which would be necessary should all pumps let go at one time.

The feed pump, which is generally a vertical direct connected type, consists of a steam cylinder and a water cylinder. For purposes of economy, this pump is usually of the simplex type operated by an automatically controlled piston valve admitting steam to both ends of the cylinder. Care must be taken to keep this automatic steam valve, usually called the chest piston, and the walls of the cylinder parallel, otherwise this valve will stick, causing a stoppage of the pump. The valve gear attached to the crosshead of the pump and operating this valve must also be watched closely to see that undue wear does not take place.

The steam piston should be examined monthly to see that the rings are tight and the cylinder should also be examined to see that the walls are parallel and in good condition. The water end of the pump needs constant attention and should be overhauled at periods not exceeding one month or when the vessel stops at terminal port. The packing in the plungers is of various types; good results are obtained by the use of a long white-metal plunger with adequate water grooves, providing the plunger is made long enough to reduce wear of the cylinder. Narrow rings of white metal should not be fitted in a plunger as many breakdowns of feed pumps have been so caused. Where the stroke of the pump does not permit a long, solid, white-metal plunger to be used, various packings of a fibrous nature can be fitted, the most common of which is called woodite or ebonite. This material gives good results for a feed water temperature up to and including 220 degrees Fahrenheit.

The valves in the water end of feed pumps should be set to a very restricted lift due to the pounding action which takes place when valves are allowed to lift too high. This hammering action wears the seat, breaks the valve and puts the pump out of commission in a short time.

Feed Water Heaters

After leaving the feed pump the water passes through the feed water heater on its way to the boiler. Although there are many kinds of feed water heaters there are two principal types, the open type and the closed type. The open or Weir type is where the exhaust steam from other auxiliaries is met and condensed by a spray formed by flowing feed water passing through jets or nozzles. The water absorbs the heat in the exhaust steam and falls by gravity to the feed pump. The open heaters must be located at a considerable height above the feed pump or excessive slamming will take place caused by the vacuum created by the piston of the feed pump liberating vapor from the hot water. The water should flow in solid mass to fill the space left by the retreating plunger. Unless great height is used for open heaters it is impossible to get the feed water above 200 degrees Fahrenheit.

The other type called the closed heater consists of a series of coils through which the feed water passes. The coils are contained in a tank-like structure into which the exhaust steam enters. When this steam comes in contact with the cooler coils heat is liberated from the steam and the condensation is drained back into the hot well. By the use of greater surfaces and higher back pressure the feed water can be brought to a very high temperature. From 220 degrees to 230 degrees Fahrenheit is very often the temperature of the feed water as it passes through the checks of the boilers. However, the bad feature of this is the back pressure and engineers should not allow this pressure to get higher than is necessary to conform with the best economical results. This can be done only by careful measurements and calibrations of the feed water. Engineers should remember that a saving of approximately 11 degrees in feed water means 1 percent saving in fuel.

After the feed water leaves the heater, pipes are very often left exposed to the atmosphere and lose by radiation the heat gained in the feed water heater. This should be corrected by heavy insulation on the feed water line.

Miscellaneous Pumps

The pumps and pumping arrangements on board modern ships are of many kinds indeed and they vary from the heavy duty ballast pump to the small service pump used to send chilled water through passenger spaces for the convenience of those on board.

The ballast pump, which is usually connected by suction

*Superintending engineer, United States Lines.

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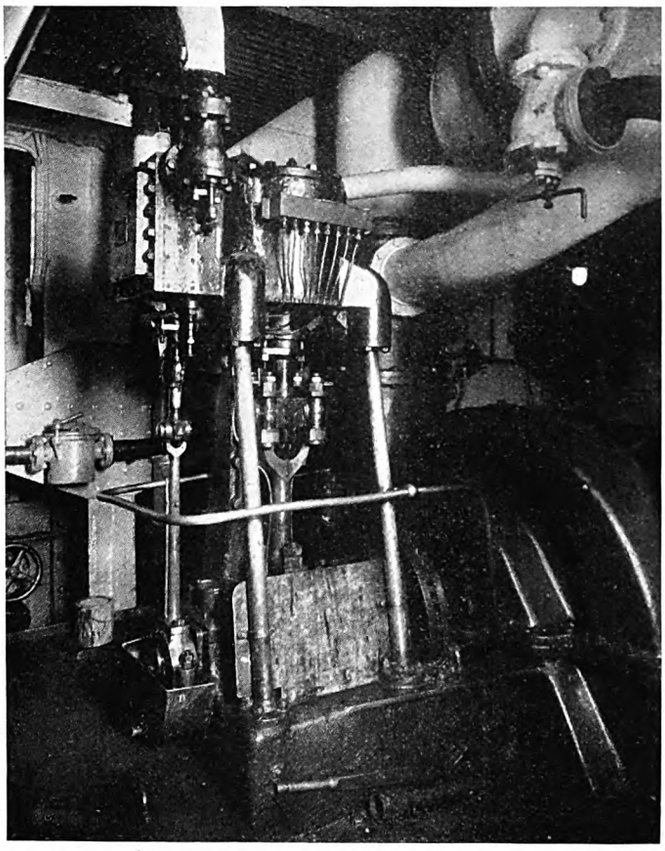
pipes to all inner bottoms, bilge lines, etc., discharges overboard; however, it sometimes has an outlet to the main condensers so that it can be used in emergency cases to keep the ship moving at a reduced speed should any mishap occur to the circulating unit.

The items set down as governing the feed pump do not hold good in the case of the ballast pump which is always of an entirely different type, functioning under a low pressure system. The steam ends are of the usual type, but the pumps are generally of the duplex type and have the valve mechanism of one cylinder operated by the crosshead of the adjoining unit which is set at right angles. The valve gear then becomes of the positive type and less care is required to keep it in operating condition. Care should be taken, however, to keep the link motion well fitted and in good condition so that the pump will not act in a jerky and faulty manner.



Reciprocating Engine Driving Centrifugal Circulating Pump

The water-end plungers are usually packed with a low grade material such as flax or other fibrous packing and the valves which are much larger than those of the feed type are usually made of rubber or some fibrous material. These pumps should undergo a periodical overhauling at intervals not exceeding 30 days.

Sanitary Pump

The sanitary pump is usually of the same type as the ballast pump, namely, low pressure because the volume is used more for sanitary purposes than for pressure. The suction of this pump is always connected to the sea and discharges only into the sanitary system usually through a tank fitted on the superstructure allowing the head of water to flow through the accommodations on board the vessel. This pump should never have any other connections on account of obstruction to the fine mechanisms of flushometer valves, etc.

Where engineers find the suction of this pump connected to bilges, they should change this by blanking off this inlet, thus using only clean water for the sanitary system. On some vessels that ply more or less in polluted waters, it is deemed essential to have filter tanks on the discharge side of the pump to remove all refuse from inlet water so that the delicate valves that are commonly fitted to flushometers and shower bath outlets in passenger accommodations will not be choked up. A pressure gage should be fitted to the filter so that the engineer can tell when filtering material needs changing.

Fire Pump

Fire pumps are usually of a heavier pattern than either ballast or sanitary pumps, for it is required that they maintain a pressure of at least 100 pounds per square inch for fire use on the upper decks of vessels. In order to obtain this head of water on the upper deck it often requires considerable more pressure than this at the pump. It is bad practice to have this pump connected to the bilges, since it is often used for washing decks as well as for fire use. Dirty and greasy water from bilges pumped onto the decks of passenger ships sometimes leads to blows between the deck and engineering departments.

Bilge Pump

Generally one or more pumps of adequate size are fitted for the use of bilges only. These pumps should be connected to other lines to be used in case of emergency. They are usually a combination type. All fittings on the water end of these pumps should be of composition metal to avoid corrosion.

Fresh Water Pumps

These pumps are of the usual low pressure type. Since they are used for fresh water only and as little corrosion takes place, they require the least amount of care.

Evaporators

The law requires that an adequate evaporator and distilling plant be fitted to all vessels. They are especially essential on passenger ships. Evaporators of the coil type having a capacity of between 20 to 30 tons of water per diem are usually installed aboard ship.

The manner in which evaporators function is simple in nature. Steam is taken in through coils which are partially submerged in sea water which causes the heated sea water to vaporize. This water vapor is taken either to a condenser to be used for feed water or passed into a distiller, which is nothing more than a small condenser where the distilled water is discharged through an aërator and through filters filled with animal charcoal and then discharged into the ship's drinking tanks.

The efficiency of an evaporator depends a great deal upon the amount of scale that is allowed to collect on the coils or evaporating surfaces. Many engineers use a system of filling the coils with cold water when they are hot in order to loosen this scale. This is done by blowing the evaporator entirely dry and refilling with cold water, thereby causing a sudden contraction of the heating coils which loosens the scale and allows it to break off and fall to the bottom.

This is a very bad practice and should be avoided because sudden contraction of the coils soon causes leaks in connections and fatigues the metal. The correct way to clean an evaporator is by the good old-fashioned system, that is, by opening the evaporator and removing the scale either by tapping the coils with a wooden mallet or by removing with a scraper of approved design. Safety valves should be fitted on evaporators allowing about 15 pounds per square inch shell pressure and care should be taken to keep these relief valves in good working order.

Little care is needed with the distillers except to keep the tubes tight so that salt water cannot mingle with the drinking water produced by the evaporator. Careful attention should be taken to see that the animal charcoal is kept in

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good condition and renewed at intervals of about six months, according to the amount of use the apparatus is put to.

GENERATING PLANT

Direct current of 110 volts on the two-wire system is the best practice aboard ships. The steam driven generators are either turbines direct connected, geared turbines or reciprocating engines. With either type the most important matter is to keep the governor in good condition. Due to the uneven operating loads which are always placed upon electrical plants, it is necessary to have a positive and sensitive governor. In recent years, several engineers have been killed while shutting down a turbine generator where the governor had become inoperative. Therefore, where high speed geared turbines are used, the engineer should see that he has a distant operating mechanism for shutting off the steam in case of an accident.

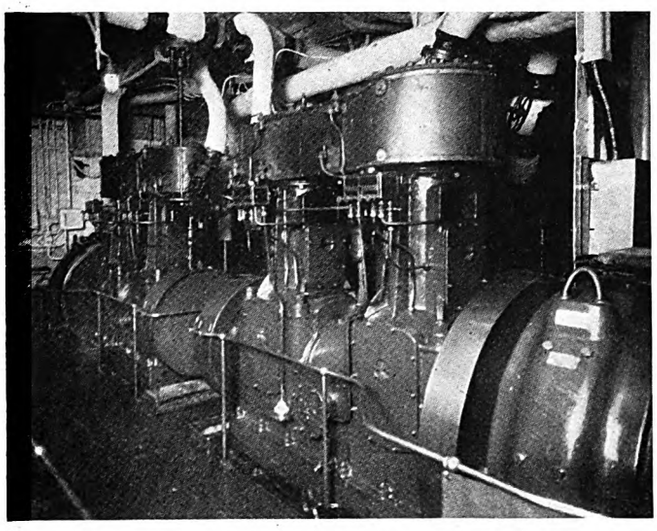
Little need be said about the reciprocating engine since it is so well known and is usually reliable and fairly efficient. The only objection that can be raised to a reciprocating engine is a tendency to pump lubricating oil back through the feed water unless care is taken in keeping piston rods, glands, etc., tight and in using the proper grade of oil in the dynamo.

REFRIGERATORS

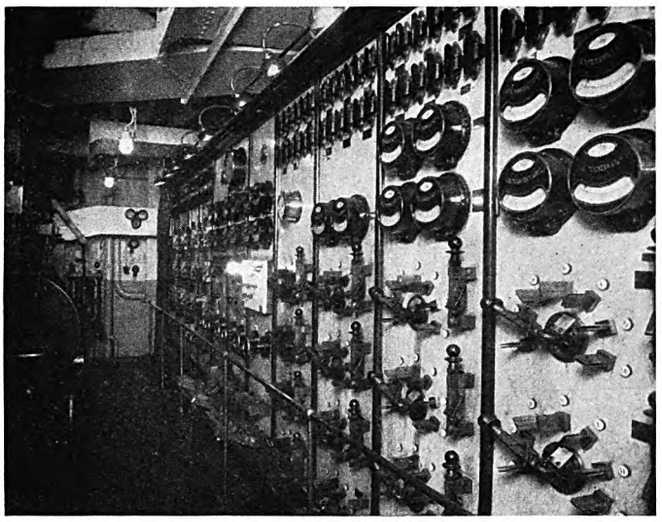
The refrigerating plants fitted to freight ships are usually of the small ammonia type of from one to three ton capacities, according to the size of the vessel and the trade route involved.

With passenger vessels, however, the refrigerating plant has become a very important item in the ship's equipment. The machines are generally either the ammonia type or the carbonic acid gas type using the indirect cooling system which is circulated to absorb the heat in the brine system. This brine system is pumped in turn through coils placed in the refrigerating compartment which is ordinarily overhead. Absorbing the heat in this compartment it is returned to the tank to be again chilled by the circulation and expansion of carbonic acid gas or ammonia. Carbonic acid gas is preferable to ammonia on account of the danger of escaping gas through a ruptured pipe or fitting. If the escaping gas is ammonia, it is liable to drive the engineers from the compartment and also, where refrigerating plants are located outside of the engine room, to cause considerable inconvenience to passengers.

Little can be said relative to the economy of either system, since both are highly efficient when used in a properly designed and constructed machine.



Two of Vessel's Equipment of Six Dynamos, Each Consisting of Compound Engine Driving Compound Wound Generator



Main Switchboard

With the ammonia plant it is necessary to maintain a much smaller clearance than with the CO_2 machine. In both cases the engineer must keep a vigilant and constant watch over all glands and connections to avoid the loss of gas. The grade of lubricating oil is also a great factor in the successful operation of either type of machine. The very highest grade of oil guaranteed by well known oil companies is none too good for the use of this apparatus. On each gas condenser a relief valve should be fitted and this valve proven to be in operating condition every week. Many condenser boxes are ruptured by the failure of this valve to work.

Sometimes the discharge valve from the condenser is closed by mistake or not opened when starting the machine and very often the discharge on the ship's side is stopped up by the vessel lying against a fender at the pier. The discharge is usually near the water line so that the overflow will not get into cargo lighters when the ship is light; this brings it close to or below water line when the vessel is loaded.

STEERING APPARATUS

Steering apparatus on board ship is very important and too much care cannot be taken to keep this machinery in the best possible condition. The steam tiller operated from the bridge by a hydraulic telemotor system is the usual type and nothing has been produced up to date which can compare to this apparatus. Many kinds of electrical systems and hydraulic gears have been installed only to be discarded and replaced by the steam apparatus.

In large ships where rudders are subject to heavy shocks from breaking seas, some means should be provided to absorb these blows either by some steam tiller apparatus such as the Brown steam tiller or by the use of heavy spiral springs and buffer rods as fitted by many well known shipbuilders.

The steam to the steering gear should be reduced in pressure through a reducing valve of some well known type, care being taken to have a by-pass fitted to pass the steam around this reducing valve in case it becomes inoperative.

On all vessels of a modern up-to-date steamship company the steering apparatus is tested out before the departure of the vessel in the presence of the chief officer, chief engineer and a representative of the shore staff. A form which states the apparatus is in good working condition is then filled out and signed by all concerned.

The greatest difference between the steering apparatus and other machinery on board the ship is the construction of the admission valve or, as it is sometimes called, the differential or follow-up valve. This valve keeps steam passing into the

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engine until the operating wheel governing the telemotor is stopped, the apparatus then stays in that position until reversed or changed by the operating wheel in the pilot house.

The telemotor and differential gear should be thoroughly overhauled and inspected at every terminal port; the steering engine itself overhauled at intervals not to exceed 60 days.

ANCHOR WINDLASS

Windlasses are used to raise the ground tackle and when fitted with a gypsy head they are also used to warp the vessel to and from piers, etc. The engine for driving this apparatus is of the usual reciprocating steam engine type which operates a wildcat gear used for raising and lowering the anchors. The wildcats are fitted to the driving shaft and are so constructed that the links of the anchor cable chain engage with sprockets which deliver the chain into the chain locker. The wildcats are fitted loose on the shaft and are so constructed that the releasing gear can be used either to clutch the gear to the engine for lifting, or, by disengaging it, for lowering the anchor. The wildcat is fitted with a brake of heavy construction called the compressor-band which is operated to check the chain and hold the same when vessel is anchored.

On larger vessels riding clamps are fitted to the chain so that the strain can be taken off the wildcats when the vessel is riding at anchor. These riding clamps are usually operated by a right and left hand thread and when exposed to the weather should be well greased to avoid deterioration by rust.

While the windlass usually comes under the care of the carpenter, it will save the steamship company much money for repairs and also annoyance to all concerned, if the engineers take an interest and see that the windlass is well oiled, greased and kept repaired, remembering that a stitch in time saves nine.

WINCHES

When in operation in port the engine department should have one man detailed to see that all bearings on winches are oiled every half hour and that the piston rods and valve stems are swabbed well with cylinder oil at least once an hour.

It is found that main engine oil which is pumped out of crank pits and filtered often works well on winches, especially where some of the rape seed content is allowed to remain. This rape seed together with the water which works into the bearings forms a lather. Considerable saving can be made by using a heavy sticky grease for slushing the gears and this should be done several times during the day when winches are in operation. Heavy oil or grease should be applied to all rods and bright parts of winches when the vessel leaves port to keep sea and rain water from rusting or corroding the metal.

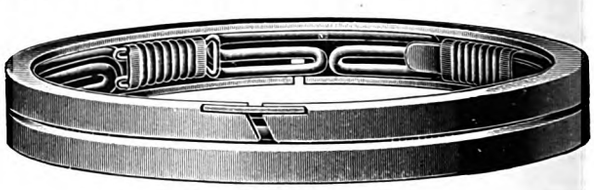
Heavy guards should be well fitted over gears and moving parts to avoid accidents to workmen and also to keep wire ropes and falls from getting between the gears, causing a breakdown. Steam pipes to winches should be covered and lagged with some of the new coatings such as thorkote which is impervious to water and makes a good insulation. Steam cylinders should not be lagged especially where a pocket is formed by the valve chest and cylinder coming together unless water-proof cement, as mentioned before, is used. The sheet iron lagging, when fitted, always leaks and the average insulation becomes soaked with water and acts more as a condenser than as an insulation, and also increases the corroding effect on the metal.

The latest style of fitting winches has proved very satisfactory, which is to place a winch several feet above the deck and when at sea the machine is covered with a heavy canvas which keeps off the rain and sea water. This system pays well by prolonging the life of the winch.

Kearfott Engineering Company Takes Over American Agency for Lockwood and Carlisle Piston Packing Rings and Springs

SO many American ships are fitted with Lockwood and Carlisle's patent piston packing rings and springs that the agency for the United States has been taken over by the Kearfott Engineering Company, of 95 Liberty St., New York.

These springs, which are standard on most British lines, are now used in increasing numbers. The spring is simple and efficient and is designed to have two distinct actions, one to press the packing rings outwards against the walls of the cylinder, and the other to make steam-tight joints on the piston and junk ring faces. The friction is reduced to a minimum so as just to ensure steam-tightness, and the side or vertical compression forms a steam-tight joint on piston



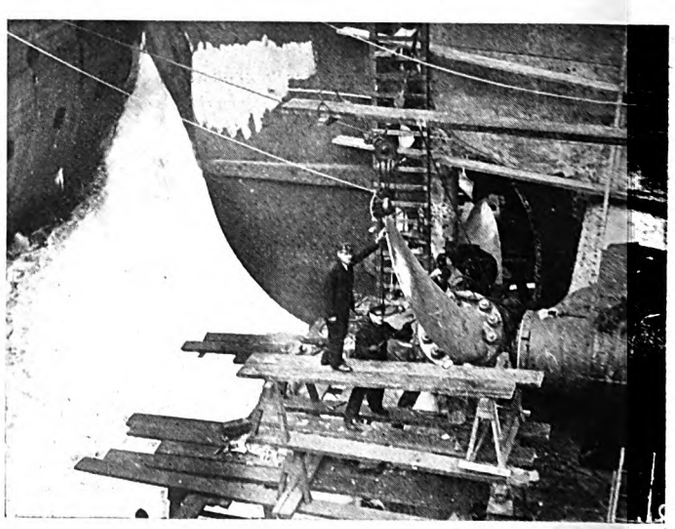
Piston Packing Ring

flanges. With these double-action springs thorough steam tightness is secured, it is claimed, with the least possible amount of friction. The packings are simply and easily adjusted when required.

For superheated steam the high pressure rings and springs have two flat uncut restraining rings, one on the top and one on the bottom, the whole forming a safeguard against excessive wear of superheated steam of high pressure.

A modification of the rings is made by Lockwood and Carlisle for piston valves. These rings and springs prevent the steam gaining access to the spring space at the back of the rings by means of a double-acting spring. This spring gives a strong vertical pressure which keeps the faces tight while the outward action, which is quite independent of the vertical, can be reduced to a minimum.

Rings and springs are made for every class of auxiliary steam engine, viz., steering, dynamo, pumps, refrigerating, winches, etc.



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View Showing Propellers and Lower Stern Frame on Steamship George Washington in Dry Dock at Charlestown Navy Yard

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Protective Coatings for Shipbuilding Purposes—Bituminous Compositions

By Horace Holden Thayer*

Continuation of a series of articles containing information regarding shipbuilding materials and their use that is not readily obtainable from shipbuilding handbooks and other generally available sources. The articles are not intended to be a complete exposition of the subject but will be found to contain items of value to the various classes of workers in this field who have to deal with these materials from the materials point of view.

WHERE a protective coating of the nature of a paint is desired but something more durably efficient than paint is needed, bituminous coatings are usually employed. Steel surfaces of coal bunkers, of double bottom water tanks under or near boilers, of refrigerated spaces and, in some cases, of the bilges are subject to excessive corrosion and are good subjects for the application of bituminous coatings.

These coatings may have an asphalt or a coal tar base; there are also somewhat similar coatings made from mineral rubber or Elaterite.

Bituminous coatings as deck coverings have been dealt with in the writer's article on that subject in the issues of this magazine for March and April, 1922. Bituminous coatings on ships' bottoms are of particular interest in connection with concrete ship construction and have been dealt with in the writer's article on "Cement and Concrete" in the June, 1922, issue of this magazine.

The coating consists of one or more coats of a solution applied directly to the clean, dry metal surface, upon which there is usually a final coat of enamel. The thickness of the enamel coat depends upon the severity of the service. The composition of the solution and enamel must be such that the covering will be firmly adherent, sufficiently elastic not to crack or break up, and of a softening point that will not allow it to flow or be indented by traffic at temperatures met with in the various places where it is used on shipboard. Specifications for these coatings adopted by the United States Shipping Board Emergency Fleet Corporation are a good guide to what is necessary to meet these requirements, and they are here copied.

SHIPPING BOARD SPECIFICATIONS FOR BITUMINOUS COATINGS

1. *Bituminous Solution and Enamel:*
   Bituminous solution and enamel will be acceptable when made on an asphalt or a coal tar base.
2. *Bituminous Solution (Asphalt):*
   This shall consist of an asphalt or combination of asphalts of same characteristics as that used in the asphalt enamel except that no mineral matter shall be added. It shall be thinned to satisfactory covering, brushing and working properties with mineral spirits. It shall dry at least to a tacky state within twenty-four hours so as to provide satisfactory bond between metal and enamel coating. This bituminous solution shall not flash below 40 degrees C. by the open cup method.
3. *Bituminous Enamel (Asphalt):*
   (a) This shall be composed of a high grade water-rejecting asphalt or combination of asphalts containing not over 20 percent of Portland cement and added lime compound. (See later—H. H. T.) It shall show the following physical and chemical characteristics:
   (b) Penetration at 25 degrees C. not more than 15 nor less than 5. (Standard A. S. T. M. method.)
   Ductility at 25 degrees C. not less than 1 centimeter. (Method A. S. T. M. Committee Reports 1915, page 349.)
   Loss at 163 degrees C. for 5 hours on 20 gram sample not more than 0.5 percent.
   (c) Melting point (ring and ball method) not less than 80 degrees C. (176 degrees F.). Total ash not more than 30 percent.
   (d) When the solution and enamel are applied in the manner of their use to a test metal panel, the coatings must be unaffected when maintained at a temperature of 65 degrees C. in a vertical position for 2 hours to the extent of not becoming tacky, running or sagging from the vertical surface.
   (e) When solution and enamel are applied in the manner of their use to a steel panel at least 18 inches square and not less than ⅛-inch thick, the coating shall stand the blow of a steel ball weighing 700 grams dropped from a height of 180 centimeters without flaking from the plate except beneath the point of impact and no radial cracks shall develop longer than 5 centimeters from center of point of impact. During this test the steel plate shall be supported in a horizontal position and support shall be placed beneath the point of impact. This test shall be made at a temperature between 25 degrees and 30 degrees C.
4. *Bituminous Solution (Coal Tar):*
   This shall consist of a coal tar pitch of the same characteristics as used in the coal tar enamel, except that no mineral matter shall be added. It shall be thinned to satisfactory covering, working and brushing properties with a coal tar distillate. It shall dry to at least a tacky state within twenty-four hours so as to provide satisfactory bond between metal and enamel coating. This bituminous solution shall not flash below 40 degrees C. by the open cup method.
5. *Bituminous Enamel (Coal Tar):*
   (a) This shall be made from coal tar pitch free from water, gas or oil tar pitch and be well mixed with finely powdered mineral filler not in excess of 20 percent. It shall show the following characteristics:
   Loss at 163 degrees C. for 5 hours on 20 gram sample not more than 3 percent.
   Melting point (cube method) in water or glycerine bath not less than 80 degrees C. (176 degrees F.).
   Total ash not to exceed 20 percent.
   Free carbon not less than 15 percent nor more than 30 percent.
   (b) When solution and enamel are applied in the manner of their use to a test metal panel, the coating must be unaffected when maintained at a temperature of 65 degrees C. in a vertical position for 2 hours, to the extent of not being tacky, running or sagging from the metal surface.
   (c) When solution and enamel are applied in the manner of their use to a steel panel at least 18 inches square and not less than ⅛ inch thick, the coating shall stand the blow of a steel ball weighing 750 grams dropped from a height of 180 centimeters without flaking from the plate except beneath the point of impact, and no radial cracks shall develop longer than 5 centimeters from center of point of impact. During this test the steel plate shall be supported in a horizontal position and support shall be placed beneath the point of impact. This test shall be made at a temperature between 25 degrees and 30 degrees C.

In 3 (a) of the above specifications there is the statement that the asphalt enamel shall contain not over 20 percent of Portland cement and added lime compound. The United States Bureau of Standards has stated regarding this that according to its experience any finely ground inert mineral filler, such as finely ground clay, is satisfactory for the preparation of bituminous enamels for the inside of the hulls of steel vessels; but that slaked lime should not be used, as its effect upon bituminous materials is questionable and serious defects probably due to it have resulted in similar mix-

*Member of the firm of Rossell & Thayer, naval architects and marine engineers, Philadelphia, Pa.

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tures produced for other purposes. It will be noted from the melting point that the enamel has to be applied hot.

As with other compounds dealt with in these articles, the test of actual service is important, and there are a number of proprietary makes of bituminous coatings which have proved satisfactory. The Bureau of Construction and Repair of the Navy Department has a dozen or more of them on its approved list.

A compound made from Elaterite or mineral rubber named Elaterite 45-A has given good results as a protective coating for iron and steel. It makes a strong bond with the steel and is applied cold. In the ease of its application it has a decided advantage over bituminous enamels. It has received classification society approval as a substitute for bituminous solution and enamel. The manufacturers definitely state, however, that for comparative results when used for this purpose not less than four coats should be applied and preferably five coats.

Some other coatings that are applied cold with heavy dauber brushes, compounds of asphaltum, oils and fillers, have given good results; but they cannot be expected to equal bituminous enamels. When using them no priming coat is required, it is unnecessary to remove oils and greases and even a little dirt on the surfaces is not a serious matter.

Navy Department requirements as to the use and method of application of bituminous compositions as given in the 1918 edition of the General Instructions for Painting and Cementing Vessels of the United States Navy are in the main as follows:

The following spaces on all vessels (except over galvanized plating of destroyers or on vessels of special light construction) shall be coated with an approved bituminous solution and cement or enamel: Trimming tanks, drainage tanks, reserve feed-water tanks, ship's fresh-water tanks, gravity tanks, sand lockers, top of inner bottom in engine and boiler rooms, dynamo and dynamo condenser rooms, also the inner surface (including stiffeners, etc.) of bulkheads surrounding the engine and boiler rooms to the height of the floor plates, and all foundations, etc., in these spaces to the same height; connecting passages between machinery spaces, shaft alleys, all closed spaces in foundations, girders and pockets that are inaccessible after completion and at junction of an inclined deck and ship's side; also the inner surface of bulkheads surrounding the dynamo condenser rooms to a height of about 2 feet above the inner bottom and foundation in these spaces to the same height; also interior of battery-charging station. Coal bunkers and chain lockers shall be coated with two coats of bituminous solution of the approved list contained in the Bureau files. Special attention shall be given to the thorough protection of portions of the machinery spaces which may become difficult of access upon completion. The foregoing shall not substitute bituminous compositions for spaces required hereinafter to be coated or filled with asphalt cement (formula No. 60).

Fresh-water tanks coated with bituminous solution and enamel shall be thoroughly washed out three times before the delivery of the vessel to the Government. In each case they shall be filled with fresh water, allowed to stand not less than six days before being emptied, and the tanks washed. The last washing shall take place not more than thirty days before the delivery of the vessel to the Government.

APPLICATION: Metal shall be free from paint and thoroughly clean, and, at times of application of any protective coating, surfaces shall be thoroughly dry. One coat of the bituminous solution shall be applied and be well spread out with a brush. This preliminary coating, necessary with either the enamel or the cement, shall be followed, after drying or at least becoming tacky, by a coat of cement or enamel applied hot; the cement being suitable for flat horizontal surface is poured on hot and spread rapidly with a brush or by some equally efficient means to a minimum thickness of one-fourth inch. The enamel which is applied hot is suitable for overhead and vertical or inclined surfaces where the cement can not be used, and shall be applied to a minimum thickness of one-sixteenth inch. Bulkhead bounding angles, boiler foundations, and other metal work projecting through the cement shall have the bituminous cement poured along the lower edge in order to completely coat the angle.

Artificial ventilation shall be furnished while any bituminous coating is being applied.

The asphalt cement referred to in the foregoing excerpts is the composition given under that heading in the writer's article on "Cement and Concrete" in the July, 1922, issue.

It will be noted that double bottom tank tops in the engine and boiler rooms are among the items required to be coated with bituminous solution and enamel. This procedure as far as the boiler room is concerned is seriously objected to by some of the large operators, marine engineers and others, as far as oil burning vessels are concerned. In some cases Portland cement or Roman cement is substituted (see the July, 1922, issue of this magazine). The claims are made that, if fuel oil on the fire room tank top catches fire, the bituminous coating on the steel work also catches fire and tends to spread the flames; that the bituminous coating absorbs spilled oil and gives off vapors for a long time afterwards, thus adding to the resultant discomfort and increasing the danger on this account as well as on account of becoming saturated with oil; and that the fuel oil disintegrates the bituminous coating and causes it to flow. The last claim is also made for lubricating oil acting upon a bituminous tank top coating in the engine room. Regardless of what merit there may be in these arguments, it is questionable, if bituminous coatings are usually necessary for the protection of boiler room tank tops where oil is used as fuel. It may be of interest in this connection to state that oil tanker specifications submitted by shipbuilders as a basis for contract specifications to the United States Shipping Board Emergency Fleet Corporation, in accordance with prewar construction and with the customary oil fired boilers, called for bituminous coatings on the engine and boiler room tank tops with but one exception. In this exception these coatings were required on the engine room tank top but not on the boiler room tank top.

The author considers that the following specifications typify good practice in the use of bituminous coatings:

1. Engine room tank top, one coat of solution and one coat of enamel ¼-inch thick.
2. Boiler room tank top, of coal burning vessels, one coat of solution and one coat of enamel ¼-inch thick.
3. Engine room bilges to 6 inches above the working platform, one coat of solution and one coat of enamel ⅛-inch thick.
4. Boiler room bilges to 6 inches above the working platform, one coat of solution and one coat of enamel ⅛-inch thick.
5. Tank top in shaft tunnel, one coat of solution and one coat of enamel ¼-inch thick.
6. Inside surfaces of shaft tunnel and recesses at forward and after ends to 6 inches above the working platform, one coat of solution and one coat of enamel ⅛-inch thick.
7. Inside surfaces of hold and 'tween deck coal bunkers where oil is not to be carried, two coats of solution on the under side of the decks, one coat of solution and one coat of enamel ⅛-inch thick on interior surfaces, and one coat of solution and one coat of enamel ¼-inch thick on shell surfaces.
8. Interior of chain locker, two coats of solution on the under side of any deck or flat, and one coat of solution and one coat of enamel ⅛-inch thick on all other surfaces except the bottom. One coat of solution and asphalt cement on the bottom.
9. Interior of refrigerating room, two coats of solution on the under side of the deck, and one coat of solution and one coat of enamel ⅛-inch thick on all other surfaces.
10. Interior surfaces of double bottom tanks in way of engine and boiler rooms, where oil is not to be carried, from the aft engine room bulkhead to about 6 feet forward of the forward boiler room bulkhead, two coats of solution on the under side of the tank top, and one coat of solution and one coat of enamel ⅛-inch thick on all other surfaces.
11. Interior of double bottom pump wells and cofferdams, two coats of solution on the under side of the tank top, and one coat of solution and one coat of enamel ⅛-inch thick on all other surfaces.
12. Floors and keelsons of single bottom vessels in way of boilers, where not filled in with cement, one coat of solution and one coat of enamel ⅛-inch thick.
13. Bulkheads in the engine and boiler rooms to one foot above the working platform, one coat of solution and one coat of enamel ⅛-inch thick.
14. Steel decks under composition deck covering, two coats of solution.
15. Bilges in cargo holds to the height of tank side brackets, one coat of solution and one coat of enamel ¼-inch thick.
16. Engine, boiler and auxiliary machinery seatings to the height of the working platforms, one coat of solution and one coat of enamel ⅛-inch thick.
17. Surfaces of shell, floor plates, etc., in shaft spectacles of twin

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screw ships, where not filled in with cement, one coat of solution and one coat of enamel ⅛-inch thick.

Additional items for which the expense of bituminous coatings is sometimes warranted are:

18. All interior surfaces of fore and after peak tanks, where not filled in with cement and where oil is not to be carried, two coats of solution on the under side of any deck or flat, one coat of solution and one coat of enamel ¼-inch thick on the shell for a height of about 5 feet, and one coat of solution and one coat of enamel ⅛-inch thick on all other surfaces.
19. Boiler room tank tops of oil burning vessels, two coats of solution.
20. All bulkheads for the distance of 18 inches up from the tank top, one coat of solution and one coat of enamel ⅛-inch thick.
21. Deck in way of the ice machine, and ice machine seatings, one coat of solution and one coat of enamel ⅛-inch thick.
22. Winch seatings and deck in way of same, one coat of solution and one coat of enamel ⅛-inch thick.
23. Steering engine seating and deck in way of same, one coat of solution and one coat of enamel ⅛-inch thick.

It will be noted that double bottom tank tops in holds are not referred to in the foregoing requirements. It is customary to have wood ceiling on these tank tops, and a very effective and inexpensive coating is obtained by a thick brush coat of liquid tar, using old brooms, and dusting this with sufficient Portland cement powder to get a white surface. The tar absorbs the cement and the black color comes to the surface in a short time, but the coating does not flow.

It might be asked why no enamel is recommended for the under side of the tank top in items 10 and 11, and the under side of other flat surfaces. This is because in such locations two coats of solution, properly applied, should be sufficient, and because the hot enamel is difficult to apply on overhead surfaces and particularly difficult in confined spaces like a double bottom.

The value of carrying the bituminous coatings in the double bottom several frame spaces forward of the boiler room bulkhead was brought home to the writer as a result of examinations of double bottom tanks made in connection with damage from grounding. In several cases the carefully protected tanks under the boilers were found to be in good condition while the steel work in the after two or three frame spaces of the tank next forward of the boiler room, upon which the usual Portland cement wash coating had been applied, was found to be badly corroded. The balance of the tank in every case was in good condition, being apparently beyond the range of destructive action due to the heat from the boilers.

British Shipping and Shipbuilding Developments

Indications Against Revival in Shipbuilding—Motorship May Be Exception—Obsolete Tonnage a Menace—Scrapping Plan Needed

By W. H. Wendon

JUDGING from the order books of the principal shipbuilders, the shipowners of the United Kingdom, after their recent little flutter in regard to the placing of contracts for new vessels, would appear to have decided almost unanimously that there must be a breathing space before further contracts for tonnage are awarded. What little demand there was for cargo steamers has, in fact, practically ceased. So far as passenger vessels are concerned, shipowners maintain that, inasmuch as building costs are, in their opinion, too high, it is idle to discuss new contracts, especially as the existing tonnage is capable of coping with the present traffic.

On the other hand, there are numerous inquiries for cargo vessels fitted with Diesels, and some of the proposals which are being made have features which are not unattractive. A Diesel-engined cargo boat, carrying 9,000 to 10,000 tons deadweight, could be built, it is computed, for about £14 per ton, smaller ships necessarily costing more per ton, and on this basis, for vessels of the type indicated, it is felt in usually well-informed circles that such boats appear to be a possibility of the not distant future which owners will be unable safely to ignore.

The factors which are inducing owners to refrain from entering into fresh tonnage commitments are worthy of closer study. Take, as a case in point, the attitude of Messrs. Alfred Holt & Company, the managers of the Blue Funnel Line. Messrs. Holt have now had delivered to them the *Dardanus*, a vessel of 10,000 tons deadweight and 15 knots speed, and, for the time being, the last Blue Funnel liner under construction. Messrs. Holt confess, with not uncommendable courage, that like all, or nearly all, other shipping people, they made the radical mistake of thinking that trade would be more prosperous and more progressive after the war. The result is that they entered into commitments which exceeded their power to fulfill conveniently, but having fulfilled these contracts they find themselves unable, as I have indicated, to give a further order, at all events for the present.

Expected Abolishment of Excess Profits Tax

The fact is, as all who have followed the subject will agree, that many British shipowners considered that, at the beginning of 1920, when freight rates were at their peak, the excess profits duty would be abolished, and that such profits would accrue as would permit of expensive new or second-hand tonnage being paid for without placing the shipowners in a dangerous financial position. But the increase of the tax from 40 percent to 60 percent dashed to the ground the hopes of the shipowners; the slump ensued, and so it happens that many owners, even at this distant time, are still hard pressed to carry out the new tonnage commitments into which they so light-heartedly entered.

The experience of Messrs. Holt & Company with the *Dardanus* is typical of what has taken place with so many other vessels. The building cost was admittedly high, but due to circumstances over which the builders had no control. The steel was purchased at a very high figure, and labor costs at the time the contract was placed were heavy. Work on the vessel had to be suspended, and during the suspension the expenses of keeping the ship in order ran on. Appreciable reductions in shipbuilding costs have been effected, but the view is unanimously held that they will remain high above the pre-war level. Unskilled men in many cases receive the same rates as—in some cases higher rates than—skilled workers, a condition which obviously should not be.

Government Regulations Increase Burden

Shipbuilders, too, are fettered by government regulations which, in years gone by, were non-existent. Delays and increases of cost are caused by the obligation to adapt plans of ships to Board of Trade rules, and especially to comply with the requirements of the International Convention. In

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at least one respect, therefore, shipbuilders are not to blame if costs are too high. Tramp steamers can, it is said, be built at 50 percent over pre-war prices, but one well-known shipbuilder gives it as his considered opinion that passenger vessels could not be constructed at such figures.

The trying time through which the shipping and allied industries are struggling to emerge is exemplified in the North Country view that, as regards new orders for ships to be built or the sale of ships that were building, the past year has been by far the worst period that any living shipbuilder can remember. Practically no new orders were given by shipowners until the closing weeks of the year; on most of those partly built work was suspended, and when ships had to be sold the prices obtainable were only about one-third of what would have been readily secured in 1919-20.

For the remainder of the current year, the Newcastle Chamber of Commerce considers that it is doubtful whether any shipbuilders or marine engineers can avoid showing a considerable loss unless they draw on their reserves. If activity in shipbuilding is to be maintained, the chamber holds that either prices must be increased or the costs of building must be further reduced.

The Menace of Obsolete Tonnage

The question: To scrap or not to scrap? continues to exercise the minds of all connected with shipping, and not least those of the shipowners themselves. There is as yet, however, no sign of a fixed policy, or anything approaching thereto. It is generally agreed that the mass of obsolete and inefficient tonnage which, in its present condition, can never be operated at a profit, will continue to menace the market.

One of the best known British shipowners stated quite recently that, in his opinion, the sooner all non-commercial American ships and old British vessels are broken up, the better it will be for the shipping trade of all nations. But, however good this famous shipowner's intentions may be, it is out of the question to avoid the personal issue, as may be gaged from the fact that, while this shipowner advocates "scrapping," one of the companies under his control has just disposed of a steamer, not for breaking up, but for operating, and to foreign buyers at that.

Scrapping Agreement Needed

When it is analyzed, however, there is nothing unnatural about the transaction, or the many others which might be cited. There is no possible chance of a scrapping program succeeding while it is confined to individual action. If the shipowner referred to had sold the vessel for breaking up, he would have realized probably about half the sum that was actually netted, and while, in the former case, he would have been acting in the best interests of shipowners generally, in that the vessel would be taken off the world's markets, his own company would have suffered to no small extent. Obviously shipowners cannot, as individuals, face their shareholders with the intimation that vessels owned by the company have been sold for breaking up at reduced prices in order that the international market might benefit.

The question of scrapping obsolete or semi-obsolete merchant ships, while not "as old as the hills," is certainly not a new one. The topic has come up for discussion whenever a depression, great or small, has appeared on the shipping horizon. But it has never been found possible to devise such an arrangement that an owner who, in the common cause, has disposed of his vessel to shipbreakers will be compensated for his loss out of a common fund.

Herr Ballin's Plan

The most authoritative and oft-quoted view on this important subject is that of the late and great German shipowner, Herr Albert Ballin, whose tragic demise some few years ago is still fresh in memory. Herr Ballin's "warning," as it was termed at the time, was penned in the closing days of 1911. The scheme suggested by Herr Ballin, to make provision during a time of prosperity for dealing with the inevitable future time of adversity, instead of waiting until the actual pressure of those harder times became burdensome, was that the owners of the large passenger lines should get rid of passenger vessels that had outlived their day, from the travelers' point of view, and should, in the public interest, cease to be in service.

A British shipowner, the late Mr. Welsford, advocated a more ambitious scheme for the temporary withdrawal from service of surplus tonnage when the world's carrying requirements fell below the capabilities of the available tonnage provided, so that, at least, barely living freights might be maintained instead of steamers being run at almost universal loss.

Insurance Compensation

Herr Ballin believed that it might be possible, through some scheme of insurance, mutual or otherwise, to provide that steamers reaching a certain age—he suggested 20 years—and that had paid a very small insurance premium on their original cost regularly during their lifetime—which premiums would have accumulated at compound interest—should, on attaining the agreed age, be considered as having performed their life-work and be put on the scrap-heap, the owners receiving a price—say, 20 or 25 percent of their original cost—in consideration of the ships being broken up.

If at an earlier date they had met with misfortune, or had been sold to foreign owners, Herr Ballin planned that the premiums paid on them would, of course, be forfeited, and, therefore, the insurance company, or society, could accept lower premiums than would otherwise be necessary. He suggested that some of the leading British insurance companies, possessed of large capital, should quote what they would undertake it for.

Herr Ballin agreed that all these projects were more or less crude, and would require consideration and careful working out. His sole purpose was to call attention to the bad times which would inevitably follow the then good times, and to suggest that it would be wisdom on the part of shipowners, both British and German, to make arrangements which would mollify the hardships that were bound to come. Much has happened since his suggestions were outlined and the Great War has ruled out Germany as a main factor in any scheme which might be planned, but, among all the great maritime powers, there is apparently none which can evolve a really workable program.

Safety of Life at Sea

The recommendations just announced by the Merchant Shipping Advisory Committee with regard to life-saving appliances, training and organization on foreign-going passenger steamships will, it is hoped, help to solve some of the many knotty problems bound up with the general question of safety of life at sea. The committee is representative of all the principal shipping interests—shipowners, officers and men, pilots, shipbuilders, naval architects and underwriters—and has as its chairman a leading shipping light—Sir Norman Hill, the secretary of the Liverpool Steamship Owners' Association.

In addition to the committee men referred to, there are two members of Parliament, whose aim on the committee is to study the welfare of the traveling public. It is noteworthy that the report which the committee has issued, through the Board of Trade, is unanimous, and the recommendations contained in the report may be summarized thus:

1. Boats for all on board should be carried as far as is possible without encumbering the decks and impeding the prompt handling of lifeboats or the marshalling of the passengers. The committee observe that this is practicable in the great majority of existing foreign-going passenger steamships.

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2. Where lifeboats for all cannot be provided without encumbering the decks and hampering the use of the boats already on board, the deficiency of accommodation for all on board should be met by means of light, buoyant apparatus.

3. In any case, however, over and above accommodation for all on board, light, buoyant apparatus should be provided for 25 percent of the persons on board for use in emergencies when it is not possible to launch all the boats.

4. Motor lifeboats fitted with wireless telegraphy should be carried in certain cases.

5. Illumination of the lifeboats in launching and immediately after being launched should be provided.

6. Boat drill stations to be established at the principal ports.

EXCEPTION TO HAGUE RULES RECOMMENDED

Progress has been made in the matter of the Carriage of Goods by Sea Bill, the measure planned to give force to the well-known "Hague Rules," but there are still important points outstanding. One of these points is in regard to coal, coke and patent fuel cargoes, which the British Coal Exporters' Federation consider should be excluded from the scope of the bill. The contention of the federation is that, while they appreciate the benefit which the rules would be to those traders who ship parcels of goods by liners under a bill of lading alone, coal exporters for 25 years, together with the shipowners and coal importers, have negotiated agreed charter-parties and suitable bills of lading, and, when amendments were necessary, a conference of the parties was duly convened.

The members of the federation feel keenly that the bill would put the coal exporters in an unsatisfactory position as compared with that under the system of voluntary agreements. So strong, in fact, is their conviction on this point that they have put their case before the Lord Chancellor, who has promised to give the whole matter his careful consideration.

The rules incorporated in the bill, however, represent an agreement reached between the shipowners, manufacturers and merchants, not only in Great Britain, but abroad, and, in fulfillment of their promise to hold by the rules as they now stand, shipowners readily support the bill. They realize that in many respects material amendments might be desired in the bill and in the rules, but they recognize that any alteration in the latter would jeopardize the prospects of securing international uniformity, and that the bill incorporating them gives substantial effect to the bargain made.

Recent Developments in Marine Insurance

Flat Rates—Fuel Oil Hazards—Constructive Total Loss—Adjustments at Destination—Under-Deck Stowage—Right of Abandonment

By "Bordereaux"

SHIPOWNERS show poor judgment when they insure their old and new vessels at a flat rate. In a recent illustration of this method the owner had one old vessel and several modern ones. He asked and received a flat rate for all. In a short time after, the old steamer was lost, prior to the policy becoming operative. The result was that the new contract for insurance became effective on the new steamers only, with the age of the old steamer influencing the entire coverage. The better method is to insure each vessel on its own basis; the new ships have the advantage of a better rate and the cost of the coverage as a whole works out more scientifically and generally to the advantage of the owner.

Oil As Fuel

BY now the shipping trade is pretty well sold on the use of oil as a fuel. This is evidenced in the rapidity with which coal is being displaced and the Diesel engine coming into its own. But from the standpoint of the underwriter doubt still exists as to the comparative hazards surrounding coal and oil. He has become familiar with bunker fires, the shifting of bunker coal, cargo damage from coal dust, etc., and he has protected himself against their consequences by the use of controlling clauses. He recognizes the advantages of oil, but he views with pardonable anxiety the next set of problems involved.

Tank types for carrying the oil reserve are bothering him. They have to be not only oil-tight at the beginning of the voyage, but they must remain so en route under stress of all kinds of weather. It was at first found convenient to use the double bottom tank, and likewise the fore and after peak tank. Experience soon showed that the double bottom tanks when partially emptied on a voyage had a serious effect upon the stability of the vessel, and also that it was unwise to permit the oil to flow from one side of the vessel to the other. Accordingly, bulkheads were recommended which would so divide the tanks as to prevent this development. It was also found that in transferring fuel from the peak tanks great care had to be exercised in making the transfer lines tight, as serious damage frequently resulted from leaky or broken transfer pipes. The number of cargo damage cases, through failure to make the tanks tight, has been legion. In one instance, for example, the manhole cover was left off the fore peak tank, and the oil flowed from the tank into hold No. 1 damaging a large quantity of flour.

These sources of danger, however, are insignificant compared with that of the great outstanding hazard of fire. An oil fire cannot be handled along the same lines as an ordinary fire. Oil tanks have frequently exploded because of fire and the inadequate methods employed to combat it. Careful data are being kept of disasters resulting from the use of oil fuel, not only by the syndicates but by individual underwriters as well. Froth, steam, and numerous fire extinguishing apparatus are provided by vessel owners, and inventive minds are constantly at work to supply new and improved safeguards. It remains, however, a question of considerable doubt as to whether cargoes which absorb odors easily can be safely carried by oil burners, with the smell of oil permeating the holds.

Constructive Total Loss

SOME interesting views by English judicial authorities were recently brought out in a case of alleged constructive total loss. In this instance the policy covered a cargo of coal en route from New York to Sevastapol, and the question of the liability of the underwriters was raised. In the course of the voyage a change of destination was made, without having been initialled by the underwriters; the coal being discharged and sold at Constantinople. A claim for constructive total loss was based on the fact that the cargo never reached its destination, and the adventure was not completed. It was held by the court that when

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goods have to be discharged, reconditioned, reloaded and carried on to the port of destination, and it is discovered that the cost of these operations exceeds the probable value of the goods at the port of destination, there is a constructive total loss. Also that there is a constructive total loss when it is clear that as a matter of business it is quite impracticable to send the cargo on to its ultimate destination. The judgment of the presiding Justice was that the adventure in this instance was put to an end by the heating of the cargo in the hold of the vessel as she lay at Constantinople, and that it was impracticable from a business point of view, and commercially impossible, to send the coal forward; and that the loss was the result of the fire. Judgment was given for the plaintiffs.

Average Adjustments at Destination

OUR readers will recall the discussion conducted in this department in recent issues with respect to the advantages and disadvantages of having general average adjustments made at ports of destination, as was the usual practice prior to the World War. This important question was taken up and thoroughly gone over at the recent meeting of the International Chamber of Commerce at Rome. At that time the American delegates presented the attitude of their underwriting countrymen, which was in opposition to any change in the present method, the argument being that too generally there is apt to be a lack of competent adjusters and of established laws and usages as respects general average at ports of destination. However, the final attitude of the International Chamber was reflected in a resolution, given below, favoring a return to the pre-war practice. M. de Roussiers, representing French shipowners' interests, suggested that parties should be allowed to provide such other mode of adjustment as they thought fit, and that there should be an admission of freedom of contract to vary the rule. This position was opposed by the British delegates, and the French suggestion was tabled. The text of the resolution, as finally adopted, was as follows:

"The settled practice as regards general average, with certain recognized exceptions, is that unless the bills of lading or charter-parties stipulate for York-Antwerp Rules, 1890, or otherwise, it will be adjusted in accordance with the laws of the port of destination, if the voyage is completed, and, if not, then laws of the place where ship and cargo part company.

"With regard to the place of adjustment, it has been the general practice, with certain exceptions, referred to later, that if at the port of destination there are established laws and usages as well as competent adjusters the adjustment is prepared there.

"In certain trades, however, when a voyage extends to ports in various countries, and/or when the insurance is placed and guarantees taken at the home port, it has been found in practice desirable to have the adjustment prepared there.

"The effort in recent years to extend this practice by stipulating in bills of lading or charter-parties for adjustment at specially named places, such as London or New York, irrespective of trade or destination, is undesirable and frequently involves delay and extra cost in adjustment.

"The Congress, therefore, strongly recommend that the practice existing before the war in these matters should be maintained."

Right of Abandonment

COURT action has been recently had in a very unusual case involving the clause refusing the right of abandonment. This clause is exceedingly rare, and in the event of a serious casualty being sustained it is bound to lead to dispute. In this particular instance the American Merchant Marine Company was sued by the Liberty Sand and Gravel Company, Inc., in connection with insurance of a dredger in New York and Long Island Sound. The dredger sank, and the underwriters contended that this resulted from unseaworthiness, which was excluded from the policy. The latter contract contained a clause reading: "The insured shall not have the right to abandon the vessel." Abandonment was, however, tendered and refused. Thereafter, it appears, the insurance company raised the wreck and placed her in drydock, and had her surveyed with the idea of repairing her. But they were charged with the duty of returning her without making any repairs or otherwise meeting liability. It would seem as though the plan at this point was to hold the underwriters to a total loss. The dredger was then bored with holes which were plugged, and she was removed from the drydock, floated to the place where she had been raised, the plugs taken out and the vessel sunk.

The judge of the lower court held that this extraordinary action amounted to acceptance of abandonment on the part of the underwriters, and the court of appeals sustained the decision. The latter court, however, decided against the dredger company on the point of sue and labor, holding that the insurance company was not liable to contribute to the expenses incurred by the assured. The dispute evidently grew out of the "right to abandonment" clause.

Under-Deck Stowage

IN a recent decision, Judge John H. Partridge, of the Federal Court at San Francisco, has added the weight of his opinion to the familiar judgment that goods must be stowed under deck if a bill of lading is to be classed as "clean." The steamer *Fairhaven,* which stranded off Mazatlan, December 6, 1921, carried a number of cases of potatoes and tomatoes, consigned to San Francisco merchants. They were stowed under the bridge, despite the issuance of a clean bill of lading. The York-Antwerp Rules and various legal authorities were cited in support of the contention that a clean bill of lading requires stowage under decks. As the goods in this instance had been carried on deck and subsequently jettisoned the court held that general average contributions were not allowable.

The Falling Mark

GERMAN marine underwriters are inserting the following clause in their policies in order to protect themselves against the loss involved in further depreciation of their national currency:

In the case of controversy arising between the insurer and the insured which is settled before the courts or by arbitration, or in the case of payment on the part of the insurer being delayed by any other reason, the insurer is not to be liable to refund the assured for any damage accruing in consequence of the deferred payment, with exception of legal interest, unless the insurer has acted negligently or wilfully in delaying such payment.

Shipping Board Restricts Averages

IT has been decided by the United States Shipping Board authorities not to have general average statements drawn up in a considerable number of cases where their vessels may have been concerned in casualties giving rise to general average acts. The reason for this action lies in a desire to save the expense incurred in preparing statements in trivial and questionable instances. Claims for loss or damage to cargo resulting from such casualties will receive full consideration. This attitude of the board has been brought to the attention of the proper authorities at Lloyd's, London, and the latter's average department has been taking the necessary steps for putting before the Shipping Board any such claims paid by underwriters of which they may hereafter receive notice. Accidents selected by the board for this treatment are those entailing but slight cargo sacrifices. The London Lloyd's is chiefly interested because of reinsurance arrangements with Americans.

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Current Admiralty Decisions of Special Interest

By Calvert B. Gill*

Limitation of Liability

IN the case of the *Harlow,* Aspinall's Maritime Law Cases, Vol. XV, Part VII, page 498, the Admiralty Division of the English High Court of Justice said, the owner of an unregistered ship is not deprived of the right to limit his liability under Sec. 503 of the Merchant Shipping Act of 1894 by reason of the fact that his ship has not been registered. The right to limit liability extended by Sec. 1, of the Merchant Shipping (Liability of Shipowners) Act, 1898, as amended by Sec. 85, Sched. 2 of the Merchant Shipping Act of 1906 to the owners, builders and other parties interested in any ship built within His Majesty's dominions is an unqualified right and is not restricted to such period after launching as may be necessary to effect registration. Lighters used for navigation in the transport of goods on the Thames, in tow of tugs and upon tides, fitted with rudders and managed by their own crews, are ships within the meaning of Sec. 742 of the Merchant Shipping Act, 1894.

Where damage is done jointly by several vessels belonging to the same owner—*e.g.,* a tug and her tugs, by the negligence of those on board some or one of them, the owner of these vessels is only entitled to limit his liability to the aggregate amount calculated upon the several tonnages of each of the vessels which might have been proceeded against *in rem* in respect of the damage done, since as the employer of all the negligent persons he might be held liable for all the damage not only in each action *in rem* but in proceedings *in personam.*

Authority of Ship's Agent

THE authority of an agent for the officers and crew of a King's ship, under the Naval Agency Act, 1864, says the High Court of Justice, Admiralty Division in the case of the *Hermione,* Aspinall's Maritime Law Cases, Vol. XV, Part VII, page 493, is not wider than that of a solicitor and does not therefore extend to the settlement of claims by the ship's officers and crew without their express authority. Thus a ship's agent who settles a claim by the officers and crew of a King's ship for salvage reward without the consent expressed or implied of the commanding officer is liable in damages to the extent of the award which the officers and crew would have received if the salvage claim had been duly prosecuted, less the amount received under the terms of settlement. The agent has no authority to settle the claims of the officer (other than the commanding officer) and crew without their instructions when the commanding officer has been giving instructions on their behalf as well as his own, notwithstanding that the commanding officer takes an exaggerated view of their claims.

Seaman's Hospital Treatment

THE Act of Dec. 20, 1920, providing that any seaman brought into the United States and found to be suffering from any of the diseases set out in Sec. 35 of the Immigration Act of 1917, shall be removed to a hospital by the immigration authorities for treatment, payment for such treatment to be made by the vessel without deduction from the seaman's wages, is paramount to the treaty between the United States and Norway, which vests exclusive jurisdiction in the Norwegian Consul over disputes for wages occurring on Norwegian ships. United States courts have jurisdiction of a suit for recovery of that portion of the wages withheld by the Norwegian Consul for the purpose of reimbursing the ship for the expenses incurred in the treatment of a seaman under the provisions of Sec. 35 of the Immigration Act of 1917. Jernberg *vs.* Young. American Maritime Cases. Vol. 5, page 426.

*Attorney at law, Baltimore, Md.

Valuation of Shipment in Bill of Lading

IN Beaumont Export & Import Co. *vs.* New York & Cuba Mail S.S. Co., 286 Federal Reporter, 120, the plaintiff endeavored to recover for the loss of a caterpillar tractor which fell overboard from a vessel of the defendant. The bill of lading, under which the tractor was shipped, limited the value of each package to $100.00. The Court said, that a provision in a steamship bill of lading issued for a shipment, wherein it was mutually agreed that, unless a higher value was stated, the value did not exceed $100.00 per package and the freight had been adjusted on such valuation, was valid and binding and limited the damages recoverable for loss of shipment to $100.00.

Hull of New Vessel Subject to Maritime Liens

WHEN the hull of a new vessel has been launched it becomes a vessel and a subject of maritime jurisdiction and may be subject to liens under the Act of June 23, 1910, Sec. 1 (Comp. St., 7783), says the Court in the *Pinthis* 286 Federal Reporter, 122. A claim for spare or reserve engine parts furnished to a new and incomplete vessel after she was launched, by one other than the contractor for her construction, is not one for construction, but for supplies for which a lien is given by the Act of June 23, 1910.

Due Diligence in Choosing Master Limits Award

WHERE libelant, a young and inexperienced school boy was shipped as an able seaman, though he had never before been to sea, and by reason of the bad judgment of the captain and the negligence of the boatswain, an inexperienced and incompetent man, shipping dunnage in a heavy sea, the libelant working in the hold was injured by a falling beam so that his leg was amputated considerably above the knee, the Court in Phillips *vs.* United States *et al.,* 286. Federal Reporter 631, said that neither the inexperience of the libelant nor the insufficiency of the equipment contributed to libelant's injury which was the result of gross error in judgment on the part of the master, so that libelant could not recover, where the operators of the vessel showed that the master had the usual certificates and that he had good recommendation and that they exercised due care in choosing him, and libelant was restricted to an award for maintenance and care.

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Questions and Answers Relating to Naval Architecture and Marine Engineering

Conducted by James L. Bates, Naval Architect, and W. B. Newton, Marine Engineer

This department is maintained for the purpose of answering all questions relating to ships and their machinery. All inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless the editor is given permission to do so.

Exhaust Pressures for Main and Auxiliary Engines

Q. (1,199).—Will you please give rules for finding the approximate exhaust pressure of steam leaving a cylinder after doing work therein? Information required for both main and auxiliary engines. T. L.

A. (1,199).—The final exhaust pressure for main and auxiliary machinery is usually decided upon at the start of a design, and all things which might affect this pressure are proportioned to suit.

For instance, in the case of auxiliary machinery, we will say the exhaust steam pressure has been fixed upon as 10 pounds per square inch gage. A branch from this system leads to the condenser and connects to it with a back pressure valve set at 10 pounds gage, so arranged as to relieve into the condenser should the pressure rise above this point. The rate at which the exhaust steam is to be used in heating the boiler feed water and its volume corresponding to 10 pounds gage passing per minute being known, the pipe leading to the heater is so proportioned in diameter as to give a velocity in feet per minute in accordance with accepted practice.

In the case of main engines, the vacuum in the condenser is fixed at the start. We know the pressure at the low pressure exhaust nozzle is from 1 to 1.5 pounds in excess of the pressure corresponding to vacuum. This condition, however, is only brought about by the proper number of expansions and correctly proportioned steam and exhaust passages and valve openings. A restricted exhaust opening would change our expected results greatly.

It is thus seen that the exhaust pressure of steam leaving a cylinder is a direct function of what we choose to make it at the outset rather than any calculations we would make within the cylinder itself.

How to Calculate Indicated Horsepower When Mean Pressures of Cylinders Are Unknown

Q. (1,198).—Will you please show how the indicated horsepower of an engine with the following particulars can be obtained when the mean pressure of each cylinder is not known:

Cylinder	Diameter	
High pressure	27 inches	Revolutions per minute, 72.
Intermediate pressure	45 inches	Steam boiler pressure, 180 pounds per square inch.
Low pressure	74 inches	
Stroke	54 inches	

A. (1,198).—In order to answer this question assumptions will be made where data are insufficient. A close enough approximation as to the power may be made without taking into consideration cylinder clearances and piston rod areas.

C_h = cut-off of high pressure cylinder = 70 percent assumed.

A_h = area high pressure cylinder = 572.6 square inches.

A_l = area low pressure cylinder = 4300.9 square inches.

$$R = \text{ratio of expansion} = \frac{A_l}{C_h \times A_h} = \frac{4300.9}{0.7 \times 572.6} = 10.73$$

Hypo. log R = 2.3749

Allow 15 pounds drop between boilers and engine.

P = pressure in high pressure steam chest, absolute = 180 pounds.

L = length of stroke, feet = 4.5

Revolutions per minute = 72

S = piston speed, feet per minute = $2 \times L \times \text{RPM} = 2 \times 4.5 \times 72 = 648$

p = back pressure = 3 pounds, assumed.

P_m = theoretical mean effective pressure referred to the low pressure cylinder, pounds per square inch.

$$= P \times \frac{1 + \text{hypo. log } R}{R} - p = 180 \times \frac{1 + 2.3749}{10.73} - 3 = 53.6$$

E = ratio of actual to theoretical mean effective pressure = (clearance not considered) 0.56 to 0.61 for three cylinder triple expansion engines. Use 0.585.

P_r = mean effective pressure = $P_m \times E = 53.6 \times 0.585 = 31.4$

Indicated horsepower =

$$\frac{P_r \times S \times A_l}{33{,}000} = \frac{31.4 \times 648 \times 4300.9}{33{,}000} = 2{,}650$$

Basic Design Problem

Q. (1,200).—In his last installment of the article on the Dyson method in the August, 1921, issue of MARINE ENGINEERING AND SHIPPING AGE, Dyson says,

"... in choosing the point of design care must be taken to plot chp/EHP well above the basic S curve."

and in the program sheet he has,

"v/V for ehp/EHP."

Does this mean that the choice of v/V is arbitrary on the part of the designer and bears no relation to ehp/EHP at the moment of selection?

Comparing this with an article by Mr. Bates in the April, 1921, issue of MARINE ENGINEERING AND SHIPPING AGE on design of screws for tunnel stern vessel, I find a series,

ehp/EHP	.223	.300	.371	.445	.52
v/V	.652	.714	.771	.822	.869

Is the selection v/V purely at random? The third decimal seems a rather exact figure for random selection. If the v/V value results from initial choice of ehp/EHP, how is the value v/V found. Dyson's articles are far from clear on this point, being rather composed for analysis than design.

Again, having sufficient data for merchant ships, assumed as standard, and having derived a chart similar to Dyson's No. 1, how could direction lines be determined for H/B greater than standard, as in Dyson's Fig. 2?

A. (1,200).—I have been unable to find in Admiral Dyson's article of August, 1921, the quotation to which you refer. Your question will, however, be answered.

It is customary after determining the basic slip (S) value to assume various values of ehp/EHP with corresponding values of v/V. These values of v/V should be so chosen at a safe distance above the basic slip line that when K is taken into consideration there is no danger of the propeller being in cavitation.

In order to determine in the beginning the largest ehp/EHP that can be used with its corresponding v/V with safety, the procedure should be as follows:

First. On Fig. 8 (May, 1921) pick a point on your S curve having an ehp/EHP value in the vicinity of what

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might be expected for the type of vessel in question. Denote this power factor by (ehp/EHP)g and read off the corresponding value of v/V.

Second. Use Curve 4, Fig. 7 (May, 1921). Read values on left hand scale corresponding to (ehp/EHP)g which we will call Zg.

Third. Zp = Zg + log K.

Fourth. Again use Curve 4, Fig. 7. Read value on bottom scale of ehp/EHP corresponding to Zp of the third step. The value of ehp/EHP is the maximum which could be used with the v/V taken with safety.

This propeller would be out of, but close to, cavitation, so to be doubly safe when loaded or in rough weather a value of ehp/EHP somewhat to the left or of v/V somewhat higher up should be chosen as one starting point. A series of such points should be found and used as a basis for design.

Referring to the propeller design of April, 1921, the values of v/V were readings taken on the S curve referred to above and were exact readings from a chart having a much finer scale than that of Fig. 8. The same is true of Fig. 7. While these readings may seem rather exact, yet to get consistent results it is often necessary; especially is this true when it is desired to plot a smooth curve of a propeller's expected performance.

The first part of this answer, I think, shows that the choice of v/V is not at random.

Charts Nos. 1 and 2 hold for merchant as well as naval vessels. It is possible that I do not understand the question.

LETTER TO THE EDITOR

Progress of Welded Construction

LIKE all new methods, especially those of the more radical order, welded construction for marine vessels continues to meet with much opposition on the part of shipbuilders. Strangely enough, the latter appear ever ready to utilize the welding art for their emergency problems whether plant repairs, correction work or new construction. The paradoxical feature of this situation is the ready acquiescence of our inspection bureaus to the use of welding for the repair of worn or damaged pressure parts of boilers, and important strength members in the ships' structure, while the use of welding for new construction of those same parts is strictly forbidden.

As a result of several years' active propaganda, reinforced by very extensive exhibits of laboratory research and practical field operations, the barrage erected in the progress of welding has been gradually weakened so that there now remains in the ammunition chest of the opposition only two "last shots," viz.: "Erection" and "inspection."

Even these appear to be no longer effective as it is recorded, both in historical reports and by photographs, that important structures have been erected and welded in perfect alinement and with absolute metal-to-metal contact without a single perforation of plates for bolting up. The system is so simple and withal inexpensive and efficient that it must eventually be utilized for the assembly of any size or form of structure, whether boss plates, stringer plates or mast fittings, to the exclusion of all present methods.

It is a fact also that the quality of any weld can now be quickly determined by a very simple, inexpensive method without damage to the seam structure. Any inspector or helper of reasonable intelligence can readily master the art and there is no longer any reason why the classification societies need refuse to accept welded construction because of uncertainty regarding the quality of the weld.

New York. WILLIAM T. BONNER.

American Delegates Appointed to International Navigation Congress

AMERICAN delegates to the thirteenth International Congress of Navigation, which will meet in London in July, under the auspices of the Permanent International Association of Navigation Congresses, have been named by Secretary of State Hughes, following the receipt of an invitation from the British government.

The congress will deal with questions of inland and ocean navigation, largely from an engineering viewpoint. Membership of the United States in the association was authorized by congress in the rivers and harbors act of 1902.

The American delegates, who were selected from government departments concerned with navigation, include the following:

Colonel J. C. Sanford, Corps of Engineers, U. S. A., retired.

Captain Frank T. Chambers, C. E. C., United States Navy.

Colonel J. C. Oakes, Corps. of Engineers, U. S. A.

Major O. N. Solbert, U. S. A., military attache at the American Embassy in London

Captain Charles L. Hussey, naval attache at the American Embassy in London.

Rear Admiral William E. Reynolds, commandant of the United States Coast Guard.

John C. Hoyt, hydraulic engineer, United States Geological Survey.

Colonel E. Lester Jones, director of the Coast and Geodetic Survey.

George R. Putnam, commissioner of lighthouses.

Walter Tower, commercial attache at the United States embassy at London.

Captain W. F. Purdy, operating manager of the United States Shipping Board at London.

Huntington T. Morse, European manager of the Emergency Fleet Corporation.

Inventor of Thermit Welding Dies

PROF. DR. HANS GOLDSCHMIDT, inventor of the widely known thermit process for welding iron and steel and for producing high grade metals and alloys, also originator of many other scientific inventions, died suddenly in Baden-Baden, Germany, on May 20, after a stroke.

Prof. Goldschmidt was born in Berlin, Germany, on January 18, 1861. His father was the proprietor of chemical works and tin smelters which he had founded in 1847. After having been graduated from the "gymnasium" of Altenburg, Hans Goldschmidt studied chemistry, physics and natural sciences in general at the universities of Berlin, Leipzig, Heidelberg, Strassburg and at the Institute of Technology at Charlottenburg.

In 1887 Prof. Goldschmidt entered the firm of Th. Goldschmidt, Essen Ruhr, Germany, in joint partnership with his brother Dr. Karl Goldschmidt. The attention of the latter was applied mainly to the business management of the company, while Prof. Hans Goldschmidt devoted himself to scientific research. Under their joint guidance the firm grew to international importance, with agencies and allied companies throughout the world.

Prof. Goldschmidt visited this country very frequently and was president of the Goldschmidt Thermit Company, now Metal & Thermit Corporation, from 1904 to 1916.

JOHN GILBERT WARD, treasurer of the Babcock and Wilcox Company, New York, died on April 22.

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PERSONAL MENTION

J. C. Cliffguard, assistant manager of the department of construction and repairs of the Standard Oil Company, is in Europe investigating different types of Diesel engines.

James McNaught, vice-president of Esplen Sons & McNaught, naval architects and marine engineers, has been sent to various European countries by the Standard Oil Company to report on the Diesel engines as manufactured abroad.

J. K. Hutchison, until recently chief engineer of the steamship *Maracaibo,* has been appointed chief of the new passenger and freight ship *Carabobo,* under construction for the Red D Line at the New York Shipbuilding Corporation's yard, Camden, N. J.

W. J. Gibson, who has been appointed chief steward of the *Leviathan,* is considered by many shipping executives to be the dean of all stewards. Mr. Gibson's first appointment as a chief steward was on the *Britannic* of the White Star Line when she was employed in carrying troops to the Boer war in 1901. He served in this capacity until the end of the war when he was transferred as chief steward to the old *Majestic* of the White Star Line. In 1903 he was again transferred as chief steward of the *Ionic* which at that time was on the New Zealand route. After service on the *Ionic* for over a year he joined the *Teutonic* on the New York route. Some months later he was transferred to the *Cretic* in the Mediterranean service and, while in this service, he also served on the *Republic.* In 1907 he was transferred as chief steward to the *Celtic* which at that time was one of the principal liners on the New York run. He served three years on the *Celtic* and then went to the *Baltic* in 1910. In 1911 he was transferred to the *Adriatic* and in March, 1912, he assumed the duties of chief steward on the steamship *Olympic,* which is now one of the principal vessels of the White Star Line. Mr. Gibson remained on the *Olympic* until he decided to become an American citizen, whereupon he resigned and came to America. His first position in America was as chief steward on the *Finland* of the American Line. At the outbreak of the war he was appointed purchasing agent for the Shipping Board at Baltimore where he remained until the armistice was signed. He then accepted the position of supervising chief steward of the International Mercantile Marine Company until he was offered and accepted the position as chief steward on the *Leviathan.*

W. J. Gibson

George F. Murphy, formerly Pittsburgh manager of the Heine Boiler Company, has been placed in charge of the New York office of this company upon the retirement of Paul H. Brangs and the resignation of his son, Harold A. Brangs. Mr. Murphy will be assisted by J. L. Daly and G. A. Knowles.

Robert H. Laverie, president of Robert H. Laverie, Inc., consulting engineers, hull, machinery and cargo surveyors, 17 State street, New York, announces that his company has taken over Messrs. Banghart and Shaumburg (formerly connected with Price, Banghart and Company) and has established a cargo division which will be under the direct supervision of Charles M. Banghart.

OBITUARY

Jesse L. Wheeler, formerly a shipbuilder and designer in the New York Navy Yard, Brooklyn, N. Y., died recently at his home in Brooklyn, aged 89.

Captain George Collins, river pilot, and formerly captain of one of the Wilson Line boats plying between Philadelphia, Pa., and Wilmington, Del., died at his home in Philadelphia on May 17.

Frank E. Wing, secretary-treasurer of the L. S. Starrett Tool Company, and secretary of the Athol Machine Company, Athol, Mass., died on May 13, following a long illness, aged 58. Mr. Wing's entire business life was spent with the Starrett company.

James Wolley, one of the best known figures of the North Atlantic waterfront and head of the Commercial Towing Company, since it succeeded the Commercial Towboat Company in 1887, died recently at his home in East Boston, Mass., aged 85 years.

Captain Benjamin A. Smith, who for a quarter of a century has been a principal figure in the Gloucester fishing industry and who was instrumental in putting Gloucester fishing schooners into the races for the international championship, died May 7 at his home in Gloucester, Mass.

Captain Francis G. Coxon, marine superintendent of the Booth Steamship Company, died recently at his home in Brooklyn, N. Y., at the age of 62. Capt. Coxon was born in England and came to this country 16 years ago and for many years was in the employ of the Booth Steamship Company.

William Shreeve Doran, president of the Alberger Pump and Condenser Company, New York, died at his home in that city May 12 after a few months' illness, at the age of 58. He was born in Bristol, Pa., and early in his career became identified with the steam pump making concern of Henry R. Worthington. For years he was regarded as one of the country's authorities on condenser operations. He was long a member of the Engineers' Club and since 1921 was vice-president.

Rear-Admiral William Sheffield Cowles, 76 years old, brother-in-law of former President Theodore Roosevelt, died at his home in Farmington, Conn., on May 1. During the Spanish war Rear-Admiral Cowles was in command of the gunboat *Topeka.* He was retired on August 1, 1908, after 45 years in the naval service. At that time he was chief of the Naval Bureau of Equipment and a member of the Board of Construction. During President Roosevelt's administration Rear-Admiral Cowles, then a commander, was the President's naval aide.

Captain Alexander McDougall, seventy-eight years old, internationally known shipbuilder and inventor, died on May 23 at his home in Duluth, Minn., following an operation. Captain McDougall, after sailing the Great Lakes for twenty years, obtained the assistance of Captain Thomas Wilson, of Cleveland, in building the first whaleback. As president of the McDougall-Duluth Company, during the war, he directed construction of a large fleet of lake freighters and steamers for the Great Lakes and coastwise trade.

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The Month's Shipping and Shipbuilding News in Brief

Shipyard, Steamship and Port Activities and Other Notes of Interest in All Branches of the Marine Industries

Shipping Problems Discussed at Marine Association Banquet

AT the spring banquet of the American Marine Association, which was held at the Waldorf-Astoria, New York city, on the evening of May 3, Frank J. Shipman, acting president of the association, outlined the aims and achievements of the organization and introduced as toastmaster Mr. Charles H. Potter, president of the United States Ship Operators Association.

Sounding the keynote of the evening as the American merchant marine Mr. Potter introduced Senator Royal S. Copeland, of New York, who expressed the opinion that the merchant marine would be of little use without freight or cargo and suggested it was first necessary to rehabilitate the nations of the world so that commerce of the world could resume its normal flow. Replying to Senator Copeland, Stevenson Taylor, president of the American Bureau of Shipping, pointed out the fact that if we wait for the resumption of the world's commerce some other nation would carry it.

Alfred G. Smith, president of the American Steamship Owners Association, vigorously opposed direct government operation of ships and stated that the only way out of present difficulties is for the Government to sell its vessels as rapidly as possible, retire from business as soon as possible and provide regulations to make private competition possible. He pointed out that direct govern-

(*Continued on page* 380)

Twenty-four Millions to Be Asked By Shipping Board for New Ships to Replace Agamemnon and Mt. Vernon

A POSSIBLE expenditure of $24,000,000 for the construction of two new passenger ships for the transatlantic service, to operate in conjunction with the *Leviathan,* is seen in the latest resolution from the Shipping Board, in which it is considered too costly to recondition the *Agamemnon* and *Mount Vernon* at a total estimated price of close to $16,000,000, the plan to construct two new ships of a similar type at a total cost of about $24,000,000 being substituted.

Plans and specifications for the reconditioning of the *Agamemnon* and *Mount Vernon* have been under preparation by the firm of Gibbs Brothers, Inc., 1 Broadway, New York, and were understood to be rapidly nearing completion. It was stated that the principal work to be carried out under the proposed specifications included the construction of "blister" tanks on the port and starboard sides of each of the hulls extending about three-quarters of the length of each vessel, tapering in to present lines and designed to increase the stability of the ships as well as furnishing space for the carrying of fuel oil and ballast. The ships were also to be converted from coal to oil burners, which would involve a great quantity of piping, valves, pumps, etc.

The resolutions made by the Shipping Board with regard to these two ships were announced as follows:

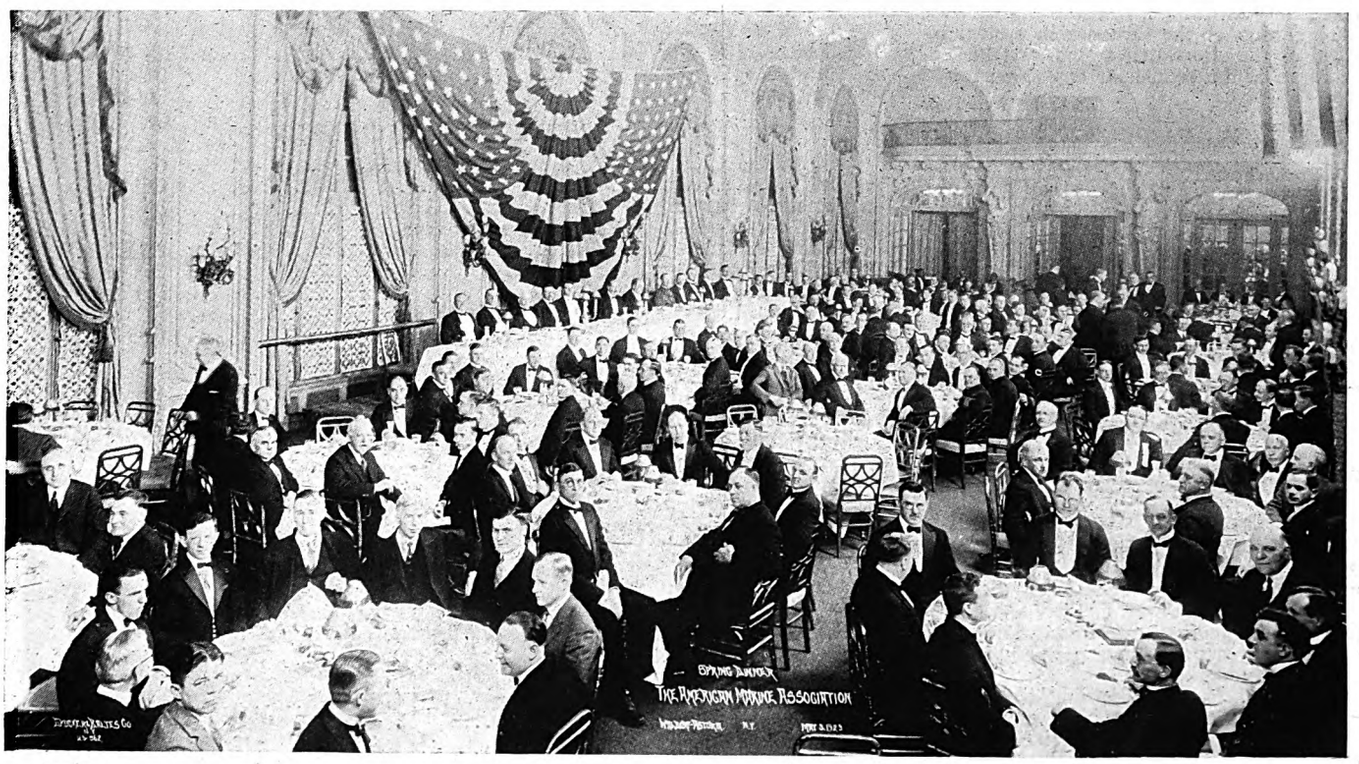
"Whereas it had originally been contemplated that the reconditioning of the *Agamemnon* and the *Mount Vernon* in order to place them in transatlantic service in conjunction with the *Leviathan* would require an expenditure of a maximum of $4,000,000 per ship; and

"Whereas careful plans and estimates prepared upon order of the United States Shipping Board and now just submitted show that a minimum of $8,000,000 per ship will be required for such purpose; and

"Whereas it is estimated that new ships of modern construction and similar type would cost $12,000,000 per ship; it is hereby

"Resolved, That the United States Shipping Board regards an expenditure of $8,000,000 per ship for reconditioning twenty-year-old vessels when $12,000,000 would construct new ships of similar type, as not justified; therefore be it further

"Resolved, That the *Mount Vernon* and



Spring Dinner of the American Marine Association at the Waldorf Astoria Hotel, New York, on May 3

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the *Agamemnon* not be reconditioned, but that in the next budget the United States Shipping Board will make request of Congress for such additional appropriation as would be required for the construction of two modern ships, smaller in size than the *Leviathan,* but comparable in every way for transatlantic service in conjunction with the *Leviathan.*"

Eastern Company's New Program to Cost $3,500,000

NORFOLK, Va. (Special).—Plans of the Eastern Steamship Lines for financing extension of service of their lines, among which is the Old Dominion Transportation Company operating between this city and New York, have been approved by stockholders, according to information just received from Boston.

The company will issue new stock to provide $3,500,000 for carrying out the program decided upon since the acquisition within the last two months of the Old Dominion Transportation Company, and the Old Dominion Steamship Company, which formerly operated on the Norfolk-New York route.

Not only will Norfolk get a daily service to New York, but other lines operated by the Eastern Steamship Lines will be given additions and improvements in service.

Shipping Board Increases Seamen's Wages

AFTER several conferences between the representatives of the United States Shipping Board and representatives of the International Seamen's Union with reference to wages and conditions of seamen on Shipping Board vessels, and after thorough investigation by the Board the following increase in seamen's wages were announced, effective May 14, with certain changes in working conditions such as the inauguration of the three-watch system instead of the two-watch system and the observance of the eight-hour day in port:

	Old Scale	*New Scale*
Carpenter	$70.00	$80.00
Carpenter's mate	60.00	70.00
Boatswain	65.00	75.00
Boatswain's mate	60.00	70.00
Quartermaster	60.00	70.00
Able seaman	55.00	62.50
Ordinary seaman	40.00	47.50
Storekeeper	60.00	70.00
Deck engineer	70.00	80.00
Pumpman	70.00	80.00
Donkeyman	65.00	75.00
Storekeeper	65.00	....
Oiler	65.00	72.50
Fireman:		
Oil burner	57.50	65.00
Coal burner	57.50	67.50
Coal passer	50.00	60.00
Wiper	50.00	57.50
Watertender	65.00	72.50

Shipping Problems Discussed at Marine Association Banquet

(*Continued from page 379*)

ment operation is impractical and therefore unwise but that by open and frank deliberation between government representatives and private operators the shipping problem might be gradually worked out.

Joseph E. Sheedy, vice president of the Emergency Fleet Corporation, gave a detailed account of the constructive measures carried out by the Shipping Board in the operation of its vessels.

Proposed Oceanic Ships Are to Be Modernly Equipped Passenger and Cargo Carriers; Details of Construction

FINAL decision as to whether or not the Oceanic Steamship Company, of San Francisco, Cal., will build two new passenger and cargo ships for the San Francisco-Australia service, is expected in the near future, according to official information obtained by MARINE ENGINEERING AND SHIPPING AGE. Frederick S. Samuels, assistant to the president of the company, has been in Washington with the proposal to the Shipping Board and the Postmaster General that the company will build these ships if they can obtain a reasonable compensation under Section 24 of the Marine Act of 1920 and providing that the cost of construction is not excessive. Although plans and specifications are ready to go out the bids will not be asked until favorable action is taken.

The proposed vessels are to have an overall length of 500 feet, propulsion to be by two Curtis turbines, direct-connected to generators (3,640 R. P. M.), and two synchronous motors (5,000 S. H. P.), steam being supplied by six B. & W. watertube boilers burning oil for fuel.

The ships, if built, are to be put into the San Francisco-Honolulu-Pago Pago-Sydney service. The principal data concerning the proposed ships is as follows:

CHARACTERISTICS

Length, over all	500'-0"
Length, B. P.	475'-0"
Beam, molded	63'-0"
Depth M. L. D. to Upper Deck	40'-0"
Load Draft	25'-0"
Block coefficient at 25'-0" draft	0.631
Midship coefficient at draft	0.974
Prismatic coefficient at draft	0.648
Speed	18 K.
Cruising Radius @ 15 K. 25' D. Nautical Miles	20,800
Framing	transverse
Class A-1—American Bureau and Lloyd's Register.	

TONNAGES

Weight of Ship, light	7800 T.
Displacement @ 25' d	13600 T.
Deadweight Capacity	5800 T.
Tons per inch @ 25' d	54.5
Deadweight cap. @ 26' d	6464 T.

COMPLEMENT

Deck Department		36
Engine Department		34
Steward's Department		90
Total Crew		160
1st cl. Passengers normal 160	max.	212
2nd cl. Passengers normal 142	max.	142
Total Passengers normal 302	max.	354
Total Complement normal 462	max.	514

HANDLING EQUIPMENT

Masts, steel	2
Booms, wood, 6 tons capacity	6
Booms, wood, 8 tons capacity	2
Booms, steel, 30 tons capacity	1

DECK MACHINERY

Steering Gear	Electric hydraulic
Windlass, vertical type	Motor-driven
Capstans, 4, motor driven	Dock type
Winches, 8, compound geared	Motor-driven

LIFE-SAVING EQUIPMENT

Lifeboats, 8, double-ended, 50 persons	28'-0"
Motorboats, 2, 50 persons	28'-0"
Workboat, 1,	20'-0"

PROPELLING MACHINERY

Boilers—B. & W. Watertube	6
Fuel	Oil
Number of burners per boiler	5
Draft, forced—Independent closed ashpit type.	
Heating surface	25,056 sq. ft.
Working Pressure	265 pounds
Superheat	160 deg.
Normal fuel consumption, 25'-0" Draft, 15 K.	57 tons per day
Fuel per horsepower hour	0.85 lbs.

ENGINES

2 Curtis turbines direct connected to generators	3640 R.P.M.
2 Synchronous Motors, each	5000 S.H.P.
Revolutions per minute	120
Overload capacity	15%
Revolutions @ overload 5750 S.H.P.	130
Steam Consumption per S.H.P.	9 lbs.
Normal shaft horsepower	10,000
Overload shaft horsepower	11,500

PROPELLERS—NO. 2

Type—4 blade, built up manganese bronze blades and cast iron hubs, about 14'-0" diameter and 18'-0" pitch.

AUXILIARY MACHINERY

Refrigerating Machines—Vulcan marine type	2	Distillers	1
Condensers, Main	2	Feed Water Heater	1
Condensers, Auxiliary	1	Feed and Filter Tanks	1
Evaporators	2	Pumps, Motor and Steam Driven	20

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AUXILIARY ELECTRICAL EQUIPMENT

2—300 K.W. General Electric D. C. generators driven by Curtis turbines.
1— 5 K.W. Gasoline driven emergency set.

CAPACITIES

CARGO No. 1 hold @ 40 cu. ft. per ton	1013	T.
2 hold @ 40 cu. ft. per ton	2326	T.
3 hold @ 40 cu. ft. per ton	614	T.
4 hold @ 40 cu. ft. per ton	922	T.
Total	4875	T.
Refrigerated Cargo	18270	cu. ft.
Refrigerated Ship's Stores	7130	cu. ft.

BUNKERS

Deep Tanks	2	1725	T.
Wing Tanks	4	740	T.
Double Bottom	4	735	T.
Settling Tanks	2	50	T.
Total		3250	T.

FRESH WATER

Drinking Water	1	100	T.
Culinary Water	4	395	T.
Boiler Feed	2	270	T.
Total		765	T.

BALLAST

Fore peak	100	T.
No. 1 double bottom	87	T.
No. 2 double bottom	230	T.
No. 7 double bottom	50	T.
After peak	60	T.

America Must Build Motorships

Shipowners Cannot Safely Ignore Possibilities of Disel Propelled Vessels

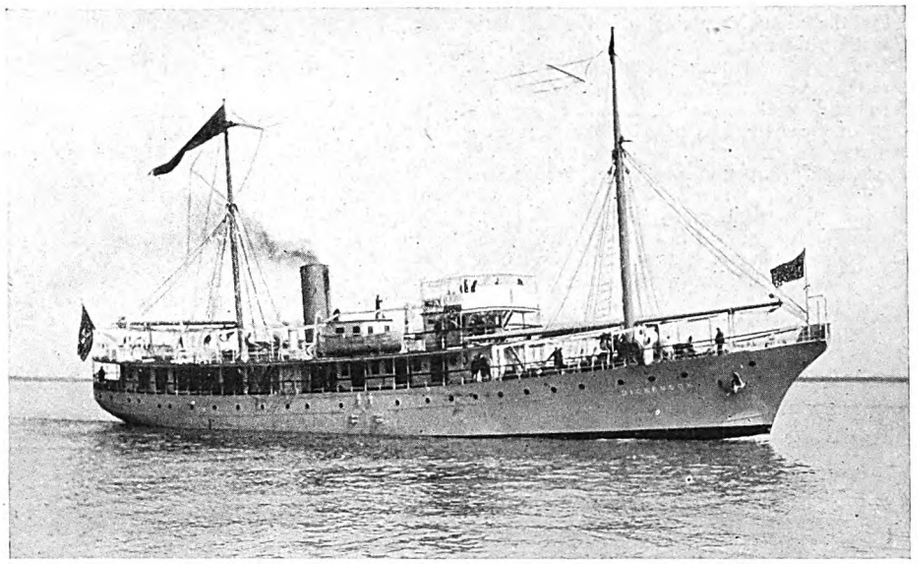
DECLARING that his recent trip abroad, in which he visited every important manufacturer of Diesel engines, had been a revelation to him, Mr. A. S. Hebble, superintending engineer of the Southern Pacific Lines, told the Propeller Club at a recent luncheon that he had learned a great many things about the Diesel that he had not known before.

Although I called at the shipyards and repair plants of practically all the maritime countries, said Mr. Hebble, I could only find two motorships undergoing repairs. The Diesel engine, he asserted, is not such a complicated affair as some would have us believe, and we should have little difficulty in securing efficient operating engineers.

A significant indication of the trend toward motorships in Europe, Mr. Hebble declared, is the fact that one of the greatest English shipping executives has recommended that his company shall not build any more steamers. Another point that he brought out was that while there are 876,000 tons of motorships in commission there are now 900,000 tons under construction.

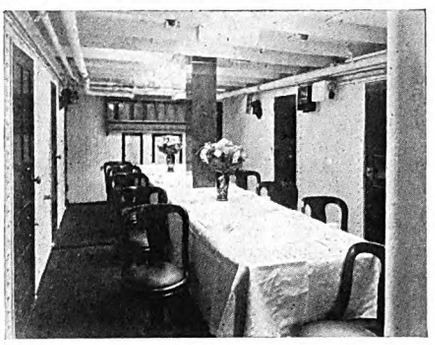
Practically every bit of trouble that has been experienced with motorships, Mr. Hebble pointed out, has been due to poor fuel. The time when we can use Mexican crude oil in Diesel engines is still far off, he declared. If this was not so we would never build another steamer. Some Diesel engine manufacturers claim that their engines will operate on crude oil but, in his opinion, nothing but the best grade of fuel oil should be used.

Cable Supply Ship Dickenson Completed



Vessel, Designed by Cox & Stevens, New York, Leaving Sun Shipyard on May 23 for Honolulu with Captain Piltz in Command

Superintendent's Room



Dining Room

Staten Island Shipbuilding Co. Is Low Bidder for Construction of New York Central Ferryboat

THE Staten Island Shipbuilding Company submitted the lowest bids for the construction of a steel ferryboat for the New York Central Railroad Company at the opening of tenders on May 15. Two sets of prices were offered, one providing for equipment with machinery supplied by the W. & A. Fletcher Co., Hoboken, N. J., the other for machinery supplied by the builder. Staten Island's price in the former case was $479,700 and in the latter $469,700.

The vessel, which was designed by J. W. Millard & Brother, of 17 State street, is to have a length over guards of 210 feet, beam over guards 66 feet 2½ inches, depth amidships 17 feet 6 inches. Propulsion is to be by two direct-acting 2-cylinder compound, jet condensing steam engines, 19 by 38 by 28 inch stroke, steam to be supplied by two Scotch return tube boilers with steam pressure at 150 pounds. Proposals were submitted from seven yards.

Tug Contract Awarded

The contract for the construction of the single screw steel towboat *John Wanamaker* has been awarded the H. E. Crook Company, Inc., of Baltimore, by the Department of Wharves, Docks & Ferries, Philadelphia, Pa. Second bids were opened on March 28, the Crook Company's price in this case being $174,240.

Bids June 22 for Four Motor Tugs

The United States Engineer Office, 815 Witherspoon Building, Philadelphia, Pa., will receive bids until June 22, 1923, for constructing and delivering four 50-foot steel motor tugs. Information on application.

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Atlantic Coast Shipbuilders Elect Officers

At the annual meeting of the Atlantic Coast Shipbuilders' Association held in Philadelphia, Monday, May 14, Harry A. Magoun, vice-president of the New York Shipbuilding Corporation, was elected president of the Atlantic Coast Shipbuilders' Association to succeed J. L. Ackerson, of the Merchants' Shipbuilding Corporation. Chas. P. Wetherbee, of the Bath Iron Works, was elected vice-president, J. Harry Mull, of the William Cramp & Sons Ship and Engine Building Company, was elected treasurer, and Clarence S. King was re-elected secretary.

The following were elected members of the executive committee: W. G. Coxe, chairman; J. H. Mull and J. G. Pew.

Chamber of Commerce Opposes Government Operation of Ships

THE following resolutions, submitted by the Marine Bureau of the Chamber of Commerce of the United States, relative to the merchant marine, were unanimously adopted at the annual meeting of the National Chamber held last month in New York:

Merchant Marine

It is necessary for the national defense and the proper growth of foreign and domestic commerce that the United States should have an adequate merchant marine, ultimately to be owned and operated privately by citizens of the United States. The Chamber is unalterably opposed to the Government engaging in commercial business, for the reason that such a course is economically inefficient, is against public interest and is in contravention of the fundamental purposes of the Government.

The Chamber therefore urges upon the President of the United States and the Shipping Board that, before the Board enters upon the commercial venture of direct operation of its Government-owned ships, further efforts should be made by counsel and collaboration with responsible shipping interests of the United States to evolve a plan by which the ships necessary to maintenance of essential services may be operated by private citizens of the United States, with a view to their acquisition and ownership by citizens as soon as they can be made self-sustaining.

To this end we ask careful consideration of the possibility of relief of private American shipping interests from inequality in world competition, believing that relief is obtainable through the relaxation or removal of burdensome restrictions without departure from proper requirements for public safety.

Ocean Bills of Lading

The last annual meeting testified to the Chamber's continuing interest in the Hague rules respecting the bills of lading under which merchandise is carried by sea. These rules should result in rights and liabilities as between vessels and shippers which are equitable to both, are suited to the conditions of carriage of goods by sea and are calculated to facilitate the use of ocean transportation. After a year of discussion the Hague rules were, in the latter part of 1922, revised in order that they may further promote these purposes. In the revised form they have been accepted by a diplomatic conference, in which the United States was represented. Appropriate action should be taken for ratification of these rules, in order that further progress may be made.

Over Twenty-two Millions to Be Spent in Port of Houston, Texas, Including Piers and Equipment

MUNICIPAL and private enterprises are planning and carrying out improvements in the Port of Houston, Tex., which will cost considerably in excess of twenty-two and one-quarter million dollars, according to official information obtained by Marine Engineering and Shipping Age. Among the activities of the private enterprises, the Houston Lighting and Power Company, through its president, E. B. Parker, has just announced that their new electric power plant, on which construction has been commenced on the Houston Ship Channel, will be of an ultimate capacity of 200,000 kilowatts and will involve an expenditure during the next five years of approximately $10,000,000. This plant will use crude oil for fuel and will have their own storage tanks together with their own wharf, which will be equipped to handle oil from tank steamers.

The Sinclair Refining Company is now actively engaged in the construction of a wharf of creosoted timber, 1,000 feet in length and 50 feet wide, at their refineries' site on the Ship Channel. The company is also installing two new batteries of high pressure stills and it is understood that their building program for the next seven months contemplates the outlay of $1,000,000 per month, which includes pipe line connection about to be completed between their plant and the North Texas and Oklahoma oil fields with an extension to the fields of Wyoming.

$4,000,000 Bond Issue

As previously announced in these columns, the Harris County Houston Ship Channel District has voted a bond issue of $4,000,000 for the construction of six new wharf units, approximately 500 feet in length each, and a 1,000,000-bushel grain elevator with workhouse and machinery design, to handle 6,000,000 bushels and the additional storage to be added as needed. The Port Commission has advertised for bids to be opened May 7 for the dry excavation on the site of the new wharves, amounting to approximately 400,000 cubic yards, and also for the construction of two large storm sewers to provide drainage for the areas back of the wharves. A contract has been let to the J. S. Metcalf Company for the engineering and design of the million-bushel grain elevator. The hydraulic dredging on the north side of the harbor along the site of the wharves is now under way with government plants and a government contract will be awarded in the near future to complete this part of the work.

Three sets of mooring clusters with walkways to shore have just been constructed adjacent to the Manchester wharf to provide a berth for vessels waiting their turn at the wharf. A carrier house with belt has been constructed from the 500,000-bushel elevator and flour mill of the Houston Mill & Elevator Company to the Port Commission's Manchester wharf and will be in readiness to handle grain shipments this coming season.

Channel Work

An allotment of $1,100,000 from the last river and harbor bill has been made for the extension of the 30-foot depth in the Houston Ship Channel and when contracts are awarded covering this sum there will only be approximately two miles additional work to be done, thirty-eight miles out of the total length of fifty miles having already been completed. Plans and estimates are being prepared by the Port Commission for the construction of about five miles of the Public Belt Railroad along the north side of the channel.

Private Enterprises

The Anderson Clayton Company has completed the dredging work for their new wharf and pilings are now being driven. The two-story concrete sheds, consisting of ten units 100 feet by 150 feet with high density cotton compress in the center, are under construction. These sheds will be built of reinforced-concrete equipped with sprinkler system and electric trolleys for the rapid handling of cotton. The wharf is to be 1,525 feet in length and the entire plant is to be ready for operation by August 1 of this year.

The Alexander Sprunt Company, operating the Ship Channel compress a short distance below the Anderson Clayton plant, is contemplating the construction of a wharf 800 feet in length with suitable shed for the rapid handling of export cotton.

The Texas Portland Cement Company announced recently that they propose to increase the capacity of their cement plant from 700,000 to 800,000 barrels per year, while the Galena Signal Oil Company is understood to have under contemplation some extensive additions to their oil refinery on the Ship Channel. The Humble Oil & Refining Company is steadily adding to the capacity of its plant at Baytown, twenty miles down the Ship Channel from Houston.

The Houston & Refining Company has recently installed new stills and casing plant, involving a cost of about $100,000, and two weeks ago shipped a full cargo of case oils and gasoline to Australia from the Port of Houston.

Business Notes

The San Francisco office of The New London Ship and Engine Company, of Groton, Conn., has been moved to 203 Balfour Building and is in charge of S. Burke Smith.

The American Balsa Company, Inc., has announced a change of address and telephone number to 152nd and Exterior streets, New York City; telephone, Mott Haven 1393.

The Manitowoc Shipbuilding Corporation, Manitowoc, Wis., has added another section to its steel floating dry dock that will enable the company to dock vessels up to 500 feet.

The Sprague Electric Works of the General Electric Company has consolidated its district and local offices with corresponding offices of the General Electric Company.

The New York office of the Aero Alarm Company has contracted to extend the Aero alarm system on the steamships *America* and *President Adams*. The Seattle office has contracted to extend the Aero alarm system on the *President Madison*.

William M. Connelly, formerly a marine lawyer, has been appointed manager of the steamer *Fordonian*, offices at No. 822 Marine Trust Building, Buffalo. The *Fordonian* is said to be the only Diesel electrically propelled boat on the Great Lakes. She has a carrying capacity of 3,800 tons.

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Foreign Shipping and Shipbuilding Activities

Provisional Program of Institution of Naval Architects' Summer Meeting in Holland

September 1. Arrival at Flushing at 4 p.m.*
September 2. Trip to Middelburg, Veere. Lunch at Domburg. Return to Flushing.
September 3. (*a*) Visit to the Royal Shipbuilding and Engineering Company, "de Schelde," Flushing. Lunch given by "de Schelde." Council Meeting. Papers to be read and discussed. (*b*) Visit to Middelburg. Leave about 4 p.m. Arrival Scheveningen (near The Hague)† at 7.30 p.m.
September 4. Day trip to Amsterdam. (*a*) Visit to Amsterdam Dry Dock Company, or Netherland Dry Dock Company. Lunch given by Netherlands Shipbuilding Company. Visit to the Netherlands Shipbuilding Company and to the Netherlands Machinery and Railway Material Factory "Werkspoor." (*b*) Visit to Volendam & Marken. (*c*) Visit to The Rijksmuseum and The Historical Nautical Museum. Return to Scheveningen.
September 5. (*a*) The Hague. Papers to be read and discussed. (*b*) Sight seeing. Visit to Mutters Ship Decorative Works at 4 p.m. (tea at Mutters).
September 6. (*a*) Visit to Gusto Works, Schiedam. Visit to Rotterdam Dry Dock Company. Lunch given by New Waterway Shipbuilding Company. Visit to the New Waterway Shipbuilding Company and to Wilton's Engineering and Slipways Company. (*b*) Visit to Leyden and trip to the Lake District.
September 7. Visit to Rotterdam Nautical Technical Institute and Museum. (*a*) Trip through Rotterdam Harbor. (*b*) Visit to the Burgerhout Works. Lunch given by Burgerhout Shipbuilding and Engineering Company. Return to Scheveningen. Reception and tea given by Koninklijk Instituut van Ingenieurs. Official Dinner given by the Institution of Naval Architects.
September 8. Return from Flushing to Folkestone or Dover. Lunch on board the Mailsteamer *Insulinde*, given by Mr. B. E. Ruys, manager of the Rotterdamsche Lloyd.

*The reception committee will provisicnally reserve hotel accommodation at Flushing and Scheveningen for as many as signify their intention of taking part in the meetings. Rooms will be definitely allocated at a later date.

†Alternative visits are indicated by letters (*a*) (*b*) (*c*).

First German de Luxe Steamer to Enter Transatlantic Service Since the War

The *Albert Ballin*, which will be the first steamer de luxe to be placed in the transatlantic service by a German company since the war, is now nearing completion at Hamburg from which port she is scheduled to sail for New York on July 5. The *Albert Ballin*, and her sister ship the *Deutschland*, which will go into service later in the year, are 22,000 tons gross register, and embody the latest ideas of marine construction, notably a new stabilizing device which combines the anti-rolling tank and the bilge bulge ideas. This device has already been successfully applied to naval craft but the *Albert Ballin* will be the first liner to have it.

Atlantic Transport Line to Resume Passenger Service

RESUMPTION by the Atlantic Transport Line of its direct passenger service between New York and London is one of the outstanding events in ocean steamship travel for 1923.

The original "Minne" class ships—the *Minnewaska, Minnetonka, Minneapolis* and *Minnehaha*—having been lost in the war, a new class of four ships, preserving all the essential features that made the old vessels popular, but of greater size and with every improvement essential to modern ocean-travel comfort, are being now created to take their places.

New Vessels Building

First of these vessels to be completed is the *Minnewaska*, 21,000 tons, which was launched on March 23, 1923, at the Harland & Wolff Works, Belfast, Ireland, and scheduled to make her first sailing from London to New York on August 4, 1923.

Main Particulars

Length	626 feet
Beam	80.37 feet
Depth	54 feet
Gross tonnage	21,000 tons
Cargo capacity	17,000 tons
Horsepower	15,000
Speed	17 knots
Number of boilers (oil burning)	12
Propelling machinery	Twin screw turbines
Number of passengers	369

New York-London Service

According to Atlantic Transport Line practice, the itinerary of the new ships will be the same as that of the old, namely, New York-London, London-New York direct, without stops at intermediate ports of call. The ships will sail from Pier 58, near the foot of Sixteenth street, New York City, on their eastward voyages, and from the new King George V docks, directly at the door of the world's metropolis, when westward bound.

Passenger Accommodations Amidships

On these new ships all passenger quarters are amidships, four decks in all being devoted exclusively to passenger accommodation. *A* deck is given over entirely to public rooms. *B* deck is occupied principally by suites and the larger staterooms. The dining saloon and reception room are on *D* deck.

International Navigation Week at Gothenburg, Sweden

GOTHENBURG, Sweden (Special).—Plans have been completed for a series of international conferences and special exhibitions for "Navigation Week," at the Tercentenary Jubilee Exposition in Gothenburg, Sweden. Navigation week begins on August 1, and during the week conferences of shipowners, shipbuilders, marine underwriters, and others connected with navigation will be held. The most important of these is the International Navigation Congress which will be held under the auspices of the British Chamber of Shipping.

Gothenburg, as Sweden's leading seaport, has spared no pains to make this navigation week of international importance. In connection with the Jubilee Exposition there is a special exhibit devoted to navigation and the history of navigation, where modern shipping may be seen in the perspective of its historical development.

Captain Olof Traung, director of the Gothenburg Marine Museum, is in charge of the marine exhibits. In this he has had the able advice and assistance of Admiral Hagg, the grand old man of the Swedish navy, now retired.

Canadian Government Canal and Harbor Work to Cost $15,000,000

ACCORDING to latest announcement, the Dominion Government, Ottawa, Canada, has in contemplation $14,962,300 worth of canal and harbor improvements, etc., for 1923. The following work is planned: Construction on Welland Ship Canal, $12,200,000, improvements $100,000; new construction on Trent Canal $210,000, improvements $309,000; improving Chambly Canal $48,000; Lachine Canal $56,000, and Soulanges Canal $216,000; new steel gate lifter on Sault Ste. Marie Canal $5,000; improving Port Arthur and Ft. William harbors $135,000; St. John Harbor $860,000; Toronto Harbor $433,000; Matane Harbor $100,000; repairs to Chicoutimi Wharf $29,500; L'Islet Wharf $25,000; Point aux Trembles Wharf $30,400; St. Michel de Bellechasse Wharf $25,000; extending wharf at Grand River $29,000; new wharves at Grondines $62,000; Haileyburg $26,400; breakwaters and piers at Cobourg $28,600; Port Colborne $200,000; Toronto Island $30,000; Whitby $27,500; new cable for Vancouver Island telegraph and telephone lines $5,500.

Canadian Pacific Vessels to Make Five Winter Cruises in 1924

ACCORDING to a recent announcement, the Canadian Pacific Railway, instead of chartering its ships during the winter months, will operate them in the following five winter cruises in 1924:

The *Empress of Canada*, of 33,000 tons displacement, 22,000 tons gross, will sail from New York, on January 30, on a cruise around the world. The minimum rate from and to any starting point in the United States, no matter where, will be $1,600, and for the comfort of passengers the number taken will not exceed 500.

The *Empress of Scotland*, of 35,500 tons displacement, 25,000 gross tons, will leave New York, on January 14, on a cruise to the Mediterranean, Egypt, the Holy Land and Europe. The minimum rate for the round trip, New York to New York, will be $800, and the number of passengers will be limited to 600 to avoid discomfort.

For the third consecutive year the Canadian Pacific will operate two winter cruises to the West Indies and South America. The *Empress of Britain*, of 22,000 tons displacement, 15,850 gross tons, will leave New York, on January 20 and February 20, 1924, for the West Indies, Nassau, Bermuda, Panama and Venezuela. Each trip will be about 30 days and minimum fare $250.

The fifth cruise will be called "around America," and will be from Vancouver to New York, via the Panama Canal, the *Empress of Canada* being the ship chosen.

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Marine Construction News of the Month

Ship Contracts — New Ship Concerns and Shipyard Improvements—Terminal Projects—Government Contracts

SHIPBUILDING AND REPAIRS

Repairs, Norfolk, Va.—The American steamship W. M. Irish was taken to Newport News for repairs.

Propeller, San Francisco, Cal.—The Crowley Shipyard has installed a new propeller on the tug Three Sisters.

Overhauling, Newport News, Va.—The Norwegian steamship Erie is at the Newport News shipyard for repairs.

Yacht Repairs, Jacksonville, Fla.—The yacht Firebird was taken to Merrill-Stevens Drydock Company for repairs.

Repairs to Stern Tube, Cleveland, O.—Steamer Mauna Loa was placed in No. 1 drydock for repairs to her stern tube.

Dump Scows, Oswego, N. Y.—The United States Engineering Corps is having three new dump scows assembled at Oswego, N. Y.

Steamer Drydocked, Buffalo, N. Y.—The steamer Ben Maple has been in the Buffalo drydock for examination and minor repairs.

Overhauling Tug, Jacksonville, Fla.—The tug General R. H. Jackson was awarded to Merrill-Stevens Drydock Company for repairs.

General Overhauling, Oakland, Cal.—The steam schooner Tamalpais has been taken to the Hanlon Shipyard for general overhauling.

Docked for Repairs, Lorain, O.—The steamer George B. Leonard, which wintered at Erie, Pa., will be docked at Lorain for repairs.

Lightship Repairs, Chelsea, Mass.—Boston lightship has been withdrawn and has been taken to Chelsea to undergo necessary repairs.

Miscellaneous Repairs, New Orleans, La.—The U. S. naval cutter Comanche has been taken to New Orleans to undergo miscellaneous repairs.

Repairs Completed, Savannah, Ga.—The Wilkinson Machine Works has completed repairs to the Norwegian motorship Johan Ludwig Mowinckle.

Liner Drydocked, Brooklyn, N. Y.—The American liner St. Paul has been drydocked at the Brooklyn Navy Yard for painting and scraping of the hull.

Inspection and Drydocking, San Francisco, Cal.—The Broad Arrow, of the E. R. Rich & Company, is at the Bethlehem yards for inspection and drydocking.

Battleship Repairs, Charlestown, Mass.—The battleships Delaware, Utah and North Dakota have proceeded to the Charlestown Navy Yard for minor repairs.

Dredge Repairs, Savannah, Ga.—One of the dredges of the Globe Dredging Company has been at the yard of the Wilkinson Machine Company for repairs.

Preparation for Service, Oakland, Cal.—The West Camargo, one of the Government's idle ships, was taken to the Moore shipyard to be prepared for service.

Testing and Inspection, San Francisco, Cal.—The Shipping Board tanker Llo has been placed on the Bethlehem ways for testing of her tanks and for inspection.

New Boiler, Buffalo, N. Y.—Tashenberg Brothers Boiler Works, 45 Illinois street, Buffalo, is building a new boiler for the tug Squaw, owned by James Conlon, Buffalo.

General Repairs, San Francisco, Cal.—The Main Iron Works was awarded the contract for carrying out general repairs on the Pacific Mail liner Venezuela. Price $574.

Contract Awarded, Oakland, Cal.—The Moore Drydock Company was awarded the contract for general repairs to the Pacific Mail liner President Pierce, with a price of $16,958.

Low Bidder, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation submitted the lowest bid for repairs to the Shipping Board steamer Bearport, with a price of $2,085.20.

Annual Inspection, Newport News, Va.—The Old Dominion Transportation Company's steamer Hamilton has been taken to Newport News to be drydocked for annual inspection.

Contract Awarded, Baltimore, Md.—The contract for repairs to the steamer West Cobalt, of the Blake Steamship Company, was awarded to Theodore H. Rohde, Inc., at a price of $2,215.

Steamer Repairs, Charleston, S. C.—Steamship Cotopaxi, of the Clinchfield Navigation Company, has been taken to the yard of the Charleston Dry Dock & Machine Company for repairs.

Overhauling and Extensive Repairs, San Francisco, Cal.—The steamer Siskiyou recently sailed for San Francisco, leaking badly, where she was to be drydocked for overhauling and extensive repairs.

Propeller Repairs, San Francisco, Cal.—The new Electric Line steamer Cuba has been at the Bethlehem Shipbuilding Corporation's yards for repairs to her propeller, which was found cracked in the hub.

Steamship Launched, Seattle, Wash.—The steamship Alaska, first passenger vessel of more than 200 feet in length to be built on the Pacific Coast, was recently launched from the Todd Shipyards, Seattle.

Steamer Damaged, Buffalo, N. Y.—The steamer Victor, a coal carrier on the Great Lakes, suffered $1,500 damage in a recent fire in the forecastle. The boat is owned by the Interlake Steamship Company.

Miscellaneous Repairs, Chester, Pa.—To have miscellaneous repairs made, the steamship Persia, of the Merchants & Miners Line, has been drydocked at the Sun Shipbuilding & Dry Dock Company's yards.

Steamers Damaged, Lake Superior.—Steamer William Livingstone and whaleback Frank Rockefeller recently stripped the buckets off their wheels in the ice on Lake Superior, according to reports reaching Buffalo.

Transport Repairs, San Francisco, Cal.—With a price of $9,338, the United Engineering Works was low bidder for certain repairs on the transport Cambrai, now at the Moore Drydock for cleaning and painting.

Steamship Conversion, Camden, N. J.—The steamship Ashbee is being converted into a motorship at the yards of the New York Shipbuilding Corporation and negotiations are being conducted for the sale of the ship.

Contract Awarded, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation was awarded the contract for repairing the Shell Company's oil barge Martinez, damaged in collision. Price $4,998; six days' time.

Vessel Damaged, Savannah, Ga.—The Coast Guard cutter Yamacraw was in collision with the Isbega in the Savannah River recently. The Isbega was operated by the U. S. Engineers and was considerably damaged.

Turbine Generators, San Francisco, Cal.—With a price of $7,338, the Bethlehem Shipbuilding Corporation was low bidder for installing larger Westinghouse turbine generators on the Pacific Mail liner President Wilson.

Battleship Overhauling, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation has been notified that the battleships New York, Idaho, Pennsylvania and Mississippi will be sent to Hunter's Point in July for overhauling.

General Repairs, San Francisco, Cal.—The steam schooner Katherine has been placed on the Bethlehem ways for general repairs. The Daily Freeman has also been taken to the same yard for overhauling and cleaning.

Steamer Repairs, San Francisco, Cal.—With a tender of $19,599, the General Engineering and Drydock Company, of San Francisco, Cal., was low bidder for extensive repairs to the Shipping Board steamer West Cadron.

Collier Overhauling, Portsmouth, Va.—The collier Proteus is at the Navy yard for the installation of stowage for 26-foot motor boats, installation of strainer boxes for her bilges and recommendations for stowage of gasoline drums.

Wireless, Etc., San Francisco, Cal.—The lumber carrier George L. Olson, of the Oliver L. Olson fleet, was taken to the plant of the General Engineering and Drydock Company to have a wireless outfit and new bronze propeller installed.

Reconditioning Vessel, Oakland, Cal.—The Hanlon Shipyard was low bidder for reconditioning the United States Shipping Board steamer Lake Carmona with a bid of $1,896. Work called for her being placed in "spot" condition.

Remodeling Steamer, Newport News, Va.—The contract for remodeling the Old Dominion Transportation steamer Hamilton, recently taken over by the Eastern Steamship Lines, has been awarded the Southern Shipyard of Newport News.

Hanlon Activities, Oakland, Cal.—The Hanlon Shipbuilding Company is making repairs on the barge Rufus E. Wood, steamer Saginaw, steamer Waimea, Haviside's barge No. 2, the ship Monongahela, and barkentine James Johnson.

Schooners Drydocked, San Francisco, Cal.—The lumber schooner Virginia Olson has been taken to the Alameda plant of the Bethlehem Corporation and the Avalon has been placed on the company's ways at San Francisco, Cal., for general repairs.

Steamer Overhauled, Buffalo, N. Y.—The steamer C. W. Jacobs, owned by the Hammermill Paper Company and operated out of Erie, was placed in the Buffalo drydock, Ganson street, Buffalo, May 8, for overhauling and considerable repairs.

Repairs to Steamer, Savannah, Ga.—The Wilkinson Machine Works was awarded the contract for repairs to the river steamer Hildegarde, as a result of grounding, at which time she stripped her crank shaft and dislodged the engine from the bed.

Tug Construction, Buffalo, N. Y.—Work is progressing at the Erie Basin yard on the tug being built for the Niagara Ferry Company. This vessel is 58 feet long, 16 feet beam and 7 feet hull. It is nearly all plated and should be completed by July 1.

Miscellaneous Overhauling, San Francisco, Cal.—The Matson steamer Lurline was placed on the ways of the Bethlehem Shipbuilding Corporation to have her crankshaft out for examination, and to be cleaned, painted and have other miscellaneous work done.

General Repairs, San Francisco, Cal.—The contract for general repairs to the Union Oil Company's tanker Utacarbon was awarded to the Bethlehem Shipbuilding Corporation, the entire hull to be sandblasted as well as alterations made to her oil-piping system.

Cleaning and Painting, San Francisco, Cal.—The Bethlehem Shipbuilding Corporation was awarded the work of cleaning and painting the Norwegian motorship Handicap. The same yard has also been awarded the general overhauling of the Matson carrier Enterprise.

Cargo Steamer to Be Built, Buffalo, N. Y.—The Cowles Shipyard Company, 31 St. Clair street, Buffalo, will build a power cargo steamer for the Barge Canal, dimensions to be 105 feet long, 22 feet beam and 12 feet hull. Work will be started in two or

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three weeks and it is expected that the vessel will be finished by September. It will be put into service by the Cowles Towing Company, of Buffalo.

Bids for Dories, Staten Island, N. Y.—The Superintendent of Lighthouses, Tompkinsville, Staten Island, N. Y., received sealed proposals on May 28 for the construction and delivery of three fishermen's dories, each to have a length overall of 20 feet and furnished complete.

Schooner Reconditioning, Brooklyn, N. Y.—What is said to be one of the last iron hulled clipper type vessels turned out by the famous shipbuilding firm of R. Steele & Company, the Norwegian schooner Sophie, of 1,753 tons, is to be reconditioned at the Morse Drydock Company's plant.

Tug Overhauled, Buffalo, N. Y.—The tug Globe, owned by the Seaboard Forwarding Company, is being overhauled and repaired at the Erie Basin Shipyard, 114 River street, Buffalo. Some new decks are being built and repairs will be made to the engine, boiler and other machinery.

Drydocking and General Repairs, Oakland, Cal.—The Moore Drydock Company, of Oakland, was awarded the contract for drydocking and general repairs to the United States Shipping Board steamer Dewey, at a price of $2,224.85. The other bids were: Hanlon's, $2,286.85, and Bethlehem, $2,335.85.

Voyage Repairs, Oakland, Cal.—The Moore Drydock Company received the contract for voyage repairs to the Pacific Mail liner President Lincoln, at a price of $6,464. Alterations of the fire mains from A to B deck of the President Lincoln were also awarded to the Moore Company, on a tender of $950.

Engine Repairs, San Francisco, Cal.—The Bethlehem Shipbuilding Company has been awarded the contract for repairing the port engine of the British motorship Marinula of the Shell Oil Company. This repair job is said to be the largest Diesel engine repair job that has ever been carried out on the Pacific Coast.

Vessels Drydocked, Buffalo, N. Y.—The Buffalo Dry Dock Company, Ganson street, Buffalo, has been awarded the following work: Repairs to Barge Canal boat Vincent Bird, recently damaged in collision; and the steamer Juniata, of the Great Lakes Transit Company, work of painting and replacing stern bearings.

Barges Damaged, Buffalo, N. Y.—The canal barge Ursula, owned by the Superior Transportation Company, of Buffalo, was rammed and sunk on May 15 by the steel freighter M. A. Bradley, managed by Harvey H. Brown & Company, Cleveland, Ohio. The accident occurred in the Buffalo River. The canal barge Bird was also damaged.

Sale of Floating Equipment, Brooklyn, N. Y.—Sealed bids were received in the office of the Eastern Surplus Property Control Officer, Army Supply Base, Brooklyn, N. Y., on April 23 for the purchase of floating equipment, including freight and passenger steamers, speed boats, mine yawls, launches, etc.

Reconditioning Steamer, Oakland, Cal.—At the opening of bids for the work of making changes and repairs on the steamer Waimea, formerly the City of Topeka, which was recently purchased by the Los Angeles Steamship Company from the Inter-Island Steam Navigation Company, the Hanlon Shipbuilding Company, of Oakland, Cal., was low.

Shipyard Activities, Buffalo, N. Y.—A second ferry steamer, 58 feet long, 8 feet hull and 17 feet beam, has been ordered from the Erie Basin Shipyards, Buffalo, by the Grand Island Ferry Company and work has been started. The same yard is repairing a boiler in the tug Wing, giving a general overhauling to the tug Globe and placing a new boiler in the tug Clark.

Contract Awarded, San Francisco, Cal.—The contract for the construction of a modern tank steamship, to be equipped with twin Diesel engines driving an electric generator furnishing 800 horsepower and to be 210 feet long and 40 feet beam, to be adapted for service in either the Atlantic or Pacific Ocean, has been awarded to the Bethlehem Shipbuilding Corporation by the Standard Oil Company of California.

Shipyard Activities, Mobile, Ala.—The Alabama Dry Dock and Shipbuilding Company, Mobile, has received the following contracts: Union Oil Company's steamer Hahira for examination, cleaning and painting; Coast Guard cutter Tallapoosa, scraping, painting and overhauling; Gulf Refining Company's tug E. L. Russel, rudder repairs; and the Gulf Refining Company's barge Ohio, cleaning, painting and rudder job.

Voyage Repairs, San Francisco, Cal.—The General Engineering and Drydock Company, San Francisco, was awarded the contract for voyage repairs to the United States army transport Thomas, the bids being as follows: General Engineering, $1,563; Main Iron Works, $1,809; Moore's, $1,832; Columbia Machine Works, $1,842; Bethlehem, $2,050; United Engineering, $2,162; Smith & Scanlon, $2,445, and Hanlon Shipbuilding Co., $2,498.

Shipyard Activities, Mobile, Ala.—The Alabama Drydock and Shipbuilding Company was awarded the following contracts: Shipping Board tanker Derbyline, for examination, tail shaft drawn, hull, masts, etc., painted; river steamer Volcano, rudder repairs and engine room work; Shipping Board steamer Portola Plumas (now Pure Oil Company's steamer W. E. Hutton) extensive repairs; and minor repairs to the steamship Jacob Luckenbach.

Steamer Overhauling, Buffalo, N. Y.—The Buffalo Drydock, Ganson street, Buffalo, has placed a new stem and twelve plates on the steamer Harry Yates, recently damaged by ramming a concrete pier in the harbor. The same company has put a new wheel on the steamer Mapleboro, damaged in Lake Erie, by ice, and has been awarded the contract for repairing the steamship Niagara, which broke her wheel and rudder by striking against a bank in the Welland Canal.

Destroyers, Etc., Overhauled, Norfolk, Va.—Five destroyers, Isherwood, Zreck, Lardner, Toucey and Case, are at the Norfolk Navy Yard for overhauling. Another vessel of the division is due shortly, while another division is scheduled to arrive about the middle of May for the same purpose. The minesweepers Contocook, Rail and Robin, and the supply ships Vestal, Vireo and Trogeus have been assigned by the Navy Department to follow to Hampton Roads for repairs also.

Reconditioning, Portsmouth, Va.—The Navy cargo ship Capella, which is reported at the Canal Zone on her trip from the West Coast to the Atlantic, will go to the Navy yard for work which will include investigation as to installation of waterway along the boat deck and moving the after bulkhead of the wardroom passage aft, so as to enlarge the wardroom pantry. There will also be recommendation made for installing suitable davits for dinghy on the poop deck. The pitch of the Capella's propeller will be checked.

Ferry Launched, Pittsburgh, Pa.—The largest boat ever built on the Ohio River, the George H. Walker, was recently launched from the ways of the Dravo Construction Company at Pittsburgh. The new ferry is of steel construction, 340 feet long with 91.6 feet beam, and is for the Gulf Coast Lines to be operated as a ferry between Baton Rouge and Anchorage. It will be propelled by two independently operated side wheels of thirty-one feet diameter. Operation of the boat will be directed from the pilot house by a mechanical telegraph system in place of the usual river system of bells and gongs.

Bids Asked for Motor Tugs, Philadelphia, Pa.—The motor tugs for which the United States Engineer Office, Philadelphia, will open sealed proposals at noon, Eastern Standard time, on June 22, are to have an overall length of 53 feet 3 inches, beam 14 feet 1½ inches and displacement 41 tons. The engines are to be of the multiple cylinder, vertical, two or four stroke cycle, single acting, heavy duty, marine type, capable of operating on kerosene and on fuel oils of not less than 24 degrees Baumé gravity, to be the product of an American manufacturer and of not less than 90 brake horsepower. Two of the tugs are to be delivered at Philadelphia, one at Kewaunee, Wis., and one at Chicago, Ill.

Boiler and Tank Work, Portland, Ore.—Sealed proposals were received by United States Engineer Office, 321 Custom House, Portland, Ore., on May 28, for the carrying out of boiler and tank work on United States dredge Clatsop. Principal work to be done under the specifications consists of furnishing the labor and necessary material and removing two Scotch marine boilers, and in their stead install, ready for operation, two watertube boilers to be furnished by the government; construct and install, ready for operation, two oil tanks about 5 feet diameter by 24 feet long, and two oil tanks about 4 feet by 6 feet by 13 feet; make water tanks, ready for use, out of a portion of the two aft coal bunkers and cut two hatches in the main deck each side of the engine room house, providing a hatch cover for each. Each of the furnaces is to be provided with five Coen mechanical oil burners, the registers and burners to be furnished by the government and installed by the contractor.

SHIPYARDS AND DRYDOCKS

Floating Dock, Vancouver, B. C.—Final arrangements have been made for the construction of the 15,000 ton floating drydock to be built at Vancouver, B. C., for the Wallace Dry Dock Company of that port, constructed from designs prepared by W. T. Donnelly, of 17 Battery place, New York. The dock, of wood pontoon and steel wings, will be able to handle a vessel of 575 feet and will have 98 feet in the clear. It will be built in two sections and will be ready in about six months. The Wallace Dry Dock Company will invest approximately $1,250,000 in the building project, including besides the dock a 700-foot pier, large machine shop, plate shop, blacksmith shop and power house.

Shipyard to Be Sold, Tampa, Fla.—The largest shipyard in Florida, the Oscar Daniel Shipyard, is to be sold at public auction June 6, 7 and 8, by the Industrial Plants Corporation, of New York. The sale will include all of the machinery, steel, equipment, supplies, ship chandlery, pipe, locomotive, trains, flat cars, rail, etc., located at the yard. The Oscar Daniel Shipyard was built in 1918-1919, at a cost of over $1,000,000, for the building of steel ships of the 10,000-ton class. Machinery and equipment are of the latest, most modern type. Included in this sale will be offered about 1,000 tons of new steel plates and angles. Persons planning to attend this auction sale should communicate with Frederick R. Shore, of the Industrial Plants Corporation, who has made special arrangements with the Seaboard Air Line Railway for special accommodations for such people.

NEW INCORPORATIONS

The Baltimore Steamship Company has increased its capital from $550,000 to $2,150,000.

The Argonne Steamship Company of Manhattan has filed dissolution papers at Albany.

Steamship Terminal Operating Corporation, capital $100,000, chartered under Delaware laws.

Atlantic Marine & Shipyards Corporation of Wilmington, Del., capital $100,000, chartered under Delaware laws.

The Cape Steamship Company, capital $5,000,000, chartered under Delaware laws. Incorporators: A. C. Harvey, J. M. Lee and A. L. Goodman, of Columbus, Ohio.

McGovern Plumb Salvage Corporation, capital $25,000, chartered in Delaware, to own ships and salvage boats. Incorporators: E. R. Brause and E. Levinson, of New York.

PORT IMPROVEMENTS

Wharf, Sturgeon Falls, Ont.—Department of Public Works, Ottawa, plans new wharf at Sturgeon Falls. $30,000. K. M. Cameron, acting chief engineer.

Harbor Development, Florida.—Allotment for improvement on river and harbor projects announced by the War Department includes $15,000 for Charlotte Harbor, Fla.

Wharf, Haileybury, Ont.—The Department of Public Works, Ottawa, plans to rebuild wharf destroyed by fire last year. $26,400. K. M. Cameron, acting chief engineer.

Docks, North Tonawanda, N. Y.—Tonawanda Iron Works, care American Radiator Company, Elmwood avenue, Buffalo, plans docks along Niagara River. To exceed $50,000. A. A. Landon, president.

Wharf, Blind River, Ont.—Sealed proposals were received at the office of R. C. Desrochers, Secretary of the Department of Public Works, Ottawa, May 22, for reconstructing superstructure of timber wharf.

Revetment Wall and Dock, Hamilton, Ont.—City Council and Harbor Board plan revetment wall and dock at foot of Ottawa street, concrete and earth fill with 2,000-foot boat slip. $400,000. W. F. McFaul, city engineer. W. Ainslee, 47½ Main street, E., chairman, Harbor Board.

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Contract Awarded, Philadelphia, Pa.—The Department of Wharves, Philadelphia, has awarded the contract for the construction of a steel barge with a capacity of 100,000 gallons to the Clinton Shipbuilding Company.

Dredging Operations, Norfolk, Va.—The Calkins Dredging Company, of Norfolk, has started dredging operations in Paradise Creek just south of the Navy Yard annex. The channel will be given depth to accommodate seagoing vessels.

Paint, New Orleans, La.—Sealed proposals were received by the Board of Commissioners of the Port of New Orleans, Suite 200, New Orleans Court Building, on May 31, for furnishing 1,250 gallons of yellow paint. Requisition SK-1240.

Repairs to Piers and Bulkheads, Hoboken, N. J.—The Robins-Ripley Company has been awarded the contract for repairing all the piers and bulkheads of the United States Lines in Hoboken. This work is already under way and rapidly progressing.

Grain Elevator, Winnipeg, Man.—N. Bawlf Terminal Elevator Company, Grain Exchange Building, awarded the contract for a reinforced-concrete grain elevator, 1,500,000 bushels, to Carter-Halls & Aldinger, Union Bank Building, at a price of $750,000.

Dikes and Dredging Channel, Brooklyn, N. Y.—Bids were received May 21 by J. H. Delaney, Commissioner of Docks, Pier "A," foot of Battery Place, North River, New York, for dikes and dredging channel between Mill Basin and Paerdegat Basin, Jamaica Bay, Brooklyn, N. Y. Contract 1797.

Wharf Escalators, New Orleans, La.—Sealed proposals were received by the Board of Commissioners of the Port of New Orleans at their office, Suite 200, New Orleans, Court Building, until 3 P. M., May 31, for furnishing portable escalators, for use at the Public Cotton Warehouse Wharf. Requisition E. D. 13428.

Creosoted Timber, New Orleans, La.—Sealed proposals were received by the Board of Commissioners of the Port of New Orleans, on May 31, for furnishing approximately 85,000 feet (board measure) creosoted timber, and 195 creosoted piles 50 feet long, as per Dock Board specifications. Requisitions ED-13505 and ED-13506.

Reconstructing Shed, New Orleans, La.—The Board of Commissioners of the Port of New Orleans received sealed proposals on May 31 for the reconstruction of the Celeste Street Shed, comprising tearing down and re-erecting riverside portion, raising land side portion, connecting to Market Street Shed and painting. Requisition ED-13470.

Hydraulic Work, Iowa.—Sealed proposals were received at the office of the Secretary, Mississippi River Commission, 1311 International Life Building, St. Louis, Mo., until 11 A. M., May 21, for constructing about 300,000 cubic yards of earthwork by the hydraulic method in the Louisa County Levee District No. 15, Iowa. Further information on application.

Levee Work, Iowa River.—Sealed proposals were received at the office of the Secretary, Mississippi River Commission, 1311 International Life Building, St. Louis, Mo., until 11 A. M., May 21, for constructing about 645,000 cubic yards of earthwork by the hydraulic method in the Iowa River-Flint Creek Levee District No. 16, Iowa. Further information on application.

Contract Awarded, Baltimore, Md.—The foundation dredging contract for the McComas Pier has been let jointly to the Rundel Corporation and the Sanford Brooks Company, of Baltimore. Dredging consisting of 770,000 cubic yards of mud at 19.9 cents per yard; sand and gravel, 550,000 cubic yards at 27.5 cents per yard. The sand and gravel taken from the Patapsco Terminal is to be used as a foundation on the bulkhead line at the McComas Terminal and the mud taken from the McComas Terminal is to be used as fill in small creek abreast of Thomas Cove in the harbor.

GOVERNMENT WORK

Dredging, Green Bay, Wis.—Sealed proposals were received by U. S. Engineer, Milwaukee, Wis., until 3 p. m., May 31, for dredging at Green Bay, Wis. Further information on application.

Retaining Wall and Concrete Culverts, Fergus, Ont.—Wellington Company is having plans prepared for several reinforced-concrete culverts and retaining wall; $50,000. A. W. Connor, 34 Victoria street, Toronto, engineer.

Dredging, Duck Island, Conn.—Sealed proposals were received by U. S. Engineer, Providence, R. I., until 12 m., eastern standard time, May 31, for dredging in Duck Island Harbor, Conn. Further information on application.

Dock, Milwaukee, Wis.—The Sewerage Commission, 508 Market street, awarded the contract for 1,338-foot pile and concrete dock around west end of sewage disposal plant, to W. W. Whitney, 216 West Water street, at $138,768.

Motor-Launch Hull, Vicksburg, Miss.—Bids were received by the Mississippi River Commission, Third District, P. O. Box 404, Vicksburg, until 11 a. m., May 22, for furnishing one steel motor-launch hull. Further information on application.

Jetty Construction, Mississippi River.—U. S. Engineer Office, 329 Custom House, New Orleans, received sealed proposals until 9 a. m., June 1, for jetty construction at South Pass, Mississippi River, Further information on application.

Training Wall, Etc., Richmond Harbor, Cal.—Sealed proposals were received by U. S. Engineer Office, San Francisco, Cal., until 11 a. m., June 1, for dredging and building training wall in Richmond Harbor, Cal. Further information on application.

Retaining Walls, Freehold, N. J.—Sealed bids were received until May 16 by the Board of Freeholders, Monmouth County, for reinforced-concrete retaining walls at Bridge W-43 between Avon and Belmar. G. K. Allen, Jr., 60 Broad street, Red Bank, engineer.

Dredging and Pier Removal, Calumet River, Ill.—Sealed proposals will be received at the United States Engineer Office, 537 South Dearborn street, Chicago, Ill, for dredging and pier removal in Calumet Harbor and River, Ill. and Ind. Further information on application.

Dredging, Los Angeles, Cal.—Proposals were received at the office of the U. S. Engineer, Central Building, until May 18, for dredging in Los Angeles Harbor, Area 3—1,270,000 cubic yards with maximum allowable over-depth 36,000 cubic yards; Area 4—610,000 cubic yards, over-depth allowance 20,000 cubic yards; Area 5—820,000 cubic yards, over-depth allowance 24,000 cubic yards; Area 6—200,000 cubic yards, over-depth allowance 20,000 cubic yards.

Contract Awarded, New York.—Power Corporation of New York, Northern New York Trust Company Building, Watertown, awarded the contract for 12,500 cubic yards earth and 3,000 cubic yards rock excavation, 8,500 cubic yards of earth embankment, also reinforced-concrete power house and 800-foot concrete dam, 65 feet high, 20,000 cubic yards concrete, at Flat Rock site, on Oswegatchie River, to Burns Brothers & Haley, Inc., Bank Building, Watertown, $800,000.

MARINE SOCIETIES

AMERICA

American Society of Naval Engineers
Navy Department, Washington, D. C.
Secretary-Treasurer—Commander S. M. Robinson, U. S. N., Bureau of Engineering, Navy Department, Washington, D. C.

Society of Naval Architects and Marine Engineers
29 West 39th Street, New York
Secretary and Treasurer—Daniel H. Cox.

National Association of Engine and Boat Manufacturers
29 West 39th Street, New York City
Secretary—R. R. A. Hand.

United States Naval Institute
Naval Academy, Annapolis, Md.
Secretary and Treasurer—Commander H. K. Hewitt, U. S. N.

American Marine Association
15 Park Row, New York
President—E. A. Simmons.
Secretary—K. W. Heinrich.

The New York Tow Boat Exchange
11 Moore St., New York.
Secretary—Irving G. Keller.

Port of New York Authority
11 Broadway, New York
Chairman—E. H. Outerbridge.
Secretary—William Leary.

Marine Engineers' Supply Men's Association
Room 507, 30 Church Street, New York.
Secretary—Robert P. Jones.

National Association of Masters, Mates and Pilots
National Secretary—M. D. Tenniswood, 308 Vine St., Camden, N. J.

American Society of Marine Designers
Secretary—B. G. Barnes, 202 Kendrick Ave., Quincy, Mass.

National Marine Engineers' Beneficial Association
Headquarters 311-315 Machinists Building, Washington, D. C.
Secretary-Treasurer—George A. Grubb.

Atlantic Coast Shipbuilders' Association
1701 Walnut Street, Philadelphia, Pa.
Secretary—C. S. King.

American Steamship Owners' Association
11 Broadway, New York
President—A. G. Smith.
Vice-President and General Manager—Winthrop L. Marvin.

United States Ship Operators' Association
149 Broadway, New York
President—C. H. Potter.

National Merchant Marine Association
Munsey Bldg., Washington, D. C.
President—Hon. J. E. Ransdell.

The Maritime Association of the Port of New York
78 Broad St., New York City
President—Charles H. Potter.
Secretary—Walter F. Firth.

Lake Carriers' Association
Detroit, Mich.
Secretary—George A. Marr.

Neptune Association
21 Pearl St., New York City
Secretary-Treasurer—Captain John F. Milliken.

Ocean Association of Marine Engineers
15 Whitehall St., New York City
Secretary—Bert L. Todd.

CANADA

Grand Council N. A. of M. E. of Canada
Grand Secretary-Treasurer—Neil J. Morrison, Box 886, St. John, N. B.

GREAT BRITAIN

Institution of Naval Architects
5 Adelphi Terrace, London, W. C.

Institution of Engineers and Shipbuilders in Scotland
39 Elmbank Crescent, Glasgow.

Northeast Coast Institution of Engineers and Shipbuilders
Bolbec Hall, Westgate Road, Newcastle-on-Tyne.

Institute of Marine Engineers, Incorporated
The Minories, Tower Hill, London.

ITALY

Collegio Degli Ingegneri Naval e Meccanici in Italia

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